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This Week

A review of the new cars shown at the Berlin Automobile Show heralds the birth of a new trend in German design. To meet the speed lure of the super-highways and the need for operating economy manufacturers have introduced some features that you find described in the article beginning on page 424.

On page 428 there are mechanical specifications of the Continental passenger cars directly followed by those of the British.

This week's detailed drawings are of the Pegasus engine and the Graham supercharger. See pages 433 and 434.

Strikes Paralyze Detroit

Union's Demand for Sole Bargaining Rights With Chrysler and Hudson Backed by Sitdowns

The United Automobile Workers Union delivered its ultimatum on the exclusive bargaining issue to the Chrysler Corp. March 8.

The corporation's answer was "No."

By 1:30 p. m. a sitdown strike was under way, spreading rapidly to all Chrysler plants in the Detroit area. Before night, the 59,000 Chrysler employes in Detroit plants had been thrown out of work. On Tuesday, only the assembly plants at Evansville and Los Angeles were producing cars, and these were expected to be forced to close shortly if the strike were not settled.

Cancellation orders immediately went out to suppliers and advertising was stopped. The Mack Ave. plant of Briggs Mfg. Co., supplying Chrysler bodies, suspended operations and 9000 more workers were made idle. Electric Auto-Lite Co. and City Auto Stamping Co. in Toledo began laying off workers as shipments to Chrysler were halted.

Following are the Chrysler plants closed and the number of workers they employed: Dodge Main, 25,000; Chrysler Kercheval and Jefferson plants, 8500; Chrysler Highland Park, 3000; DeSoto, 2200; Plymouth, 11,000 and New Castle, Ind., plant, 4500. Marysville and Windsor plants continued in operation.

The union's demand for sole bargaining rights also resulted in the closing of Hudson Motor Car Co.'s plants March 8, throwing 11,000 employes out of work.

Both strikes came in the midst of negotiations with the union. Chrysler was in its fourth day of conferences with union representatives and Hudson had been engaged in extended negotiations. Pickets barred Chrysler officials from their offices in the Highland Park plant Tuesday morning, preventing conferees from meeting. Union officials later apologized and the conference resumed in the afternoon. A Monday night meeting between Hudson and union representatives brought no conclusions and another meeting was scheduled for Wednesday afternoon.

Chrysler divisions were producing over 6000 units a day when the plants closed and material orders amounted to approximately $50,000,000 a month.

Repeating his declaration that "the corporation has dealt and will continue to deal with anyone representing any of our employes," B. E. Hutchinson, chairman of the finance committee, said. "The number of UAW employes is immaterial. We dealt with the UAW when it had a small number of employes and we are dealing with them now. We were dealing with them before this strike—which is different from some other situations."

The union claimed to have 2400 sitdown strikers in the Dodge main plant, 1500 in Plymouth, 2000 in Chrysler-

Strikes Cut Daily Output 6700 Units

Hopes for Production of 600,000 Cars in March Fade as Labor Disputes Again Close Plants

By Harold E. Gronseth

With major automobile producers involved in new strikes, hopes are fast fading for the industry's output to cross the 600,000 unit mark this month. The forecast was predicated on capacity operations by the leading companies and on this basis time lost by any of the plants cannot be made up later in the month if production is resumed.

The closing of the Chrysler and Hudson plants robs the industry's daily output of some 6700 units and their suspension for only a few days makes a big dent in the projected March figure. Several General Motors units also were affected by brief strikes during the past week. Before these latest interruptions, the industry had attained a daily production rate of 26,000 units, with prospects of climbing even higher before the month was over unless labor troubles interferred. Now, of course, no estimate can be made of the March output which stands to lose as much as 115,000 units if the present strikes continues through the month.

It means that the industry as a whole will go into the spring selling season with inadequate field stocks. They were none too large as it was. Although February sales ran 25 per cent ahead of February last year, this business was done on smaller stocks than were in the field a year ago. General Motors has not made up for the production lost in its divisions during the six weeks strike and is not to keep much ahead of current demand this month and next. Hudson probably is better situated from the standpoint of stocks. Ford dealers are operating on smaller inventories than a year ago.

Meanwhile, retail sales are climbing. The upward trend was plainly evident in the delivery figures for the final reporting periods of February. Retail sales of one of the leading companies during the last two weeks of the month increased 20 per cent over the first half of February and used car sales, which normally are slower in starting their spring rise, were up approximately 17 per cent. There was a pronounced week-to-week gain in both classes. Spring buying usually gets under way on a big scale in March and with the

(Turn to page 422, please)

Kercheval, 1500 in Chrysler-Jefferson, 400 in Dodge Truck, 800 in DeSoto and several hundred each in the Highland Park, Dodge Forge and Amplex plants. Originally 10,000 sat down in the Dodge main plant, which the union claims is the largest sit-down on record.

At the Hudson plants, the union claimed 400 were sitting down.

After strenuous objections on the part of Chrysler officials to being barred from their offices, the union began admitting members of the executive staff without union passes. Proprietors of beer gardens in the vicinity of the plants agreed to close after the union threatened to put picket lines in front of their doors. A factory lunch company was given the union contract to supply food to strikers in some of the plants. At others, soup kitchens were promptly set up in near-by buildings.

In a speech to Dodge workers in Solidarity Hall Monday night, union leader Richard Frankensteen declared: "We are asking for sole collective bargaining rights at Chrysler because it is the only road to permanent peace, the only solution to problems such as arose last year when 3000 of our members were let out without regard to seniority rules. This strike means that Chrysler is not going to produce any automobiles until he deals with us on this proposition. We are not asking for this bargaining power because we want to brag about it or because we want dues from a few who haven't joined, but we ask it because it is our right."

Speaking for the Chrysler Corp., B. E. Hutchinson said: "The effect of this demand and the actions of the union representatives in our shops inevitably lead to a closed shop. It is obvious that the real purpose of this demand is actually to force all our employes to go with the union or go out of our employ."

Lester L. Colbert

resident attorney of the Chrysler Corp. in Detroit

Gov. Murphy cut short his Florida vacation and returned to Detroit to be on hand during the strike.

The Chrysler Corp. applied March 10 for an injunction to oust sitdown strikers in possession of eight plants and to prevent the UAW from further interfering with operation of the corporation's plants. Order to show cause was signed by Judge Allan Campbell in Wayne Circuit Court and is returnable 9:30 a. m. March 13.

The bill of complaint names as defendants Homer Martin and other UAW officers and organizers, John L. Lewis, John Brophy and Adolph Germer of the CIO, and officers of locals in Chrysler plants. It was signed by H. A. Davies, treasurer of Chrysler Corp.

It is stated in the petition that strikers, by violation of company's rules, have terminated their employment and that they are willful, malicious and continuous trespassers and that the strikers have armed themselves with weapons to be used in maintaining further unlawful possession of the plants. The petition further cites the danger of irreparable injury and damage being done to the plant and machinery since defendants are without pecuniary responsibility and that presence of the strikers has created unsanitary conditions and fire hazard.

Following announcement of court action by the Chrysler Corp. the union withdrew from the agreement which had kept the administrative offices open. Strikers again took over the telephone switchboards and closed the gates. Picket lines were reinforced. Conferences between union representatives and Chrysler officials were moved to a downtown office building.

Chrysler Corp. has taken office space in the Buhl Building in downtown Detroit where corporation headquarters will be maintained while its administrative building at the Highland Park plant is occupied by sitdown strikers who are refusing to admit Chrysler officials or clerical workers.

Close observers were expecting Chrysler to announce shortly that the corporation's plants would remain closed until April 1 and that in the meantime employes would be given vacations with pay. This would take the place of summer vacations. In the corporation's petition for an injunction against strikers occupying its plants, it was stated that the strikers had "terminated their employment," from which it is inferred that the vacation with pay will not apply to employes on strike. Chrysler dealers are understood to have adequate stocks to carry them through this period.

GM Settlement Delayed

General Motors was unable to conclude its collective bargaining conferences with the UAW Thursday morning as expected. Union leaders objected to the phraseology of the agreement which had been drafted. The conference adjourned until Friday morning. Both sides were critical as the Thursday session ended. C. E. Wilson, of General Motors, said that the corporation was none too pleased with the way the union had kept the agreement of Feb. 11, as there had been 18 strikes in GM plants since that date. Ed Hall, of the union, accused the corporation of not living up to its part of the agreement and indicated that sitdowns could be expected right along unless the corporation observed its part better.

A one-day sitdown strike in four Chevrolet and one Fisher Body plant in Flint March 8 ended after a truce was arranged calling for resumption of operations the next morning and further negotiations on wage differentials and discrimination complaints. The strike affected 14,000 workers although only a fraction of these sat down.

A new strike broke out March 10 in the Chevrolet and Fisher Body plants in St. Louis affecting 5000 employes. Strikers protested against the Chevrolet Workers' Guild, whose members, it was charged, were being shown favoritism. The strike was settled after six hours when the management agreed to post notices that solicitation of Guild members would not be permitted and that J. H. Hatton, chairman of the Guild, would be laid off until March 22.

Strike Closes Reo

Reo Motor Car Co. closed its plants March 10 after a sitdown strike was started in which the UAW claims 1000 are participating. Around 3000 workers are affected. The following statement was issued by Don E. Bates, Reo president and general manager:

"The Reo Motor Car Co., during the 33 years of its existence, has maintained friendly relations with its employes, bargaining with the AFL, the Reo Employes Association, individual employes, and more recently with the CIO.

"Now the CIO, representing a minority, demands that it be the sole agent for collective bargaining. In fairness to employes who do not belong to the CIO, this demand has been refused.

"The Reo plants have been closed, without notice, by the CIO and through no fault of the company These plants are now being illegally held. Pay checks in full will be mailed promptly to employes."

Other Detroit Strikes

At the Packard Motor Car Co., 65 engineers staged an hour's sitdown strike Monday morning, returning to work when the management agreed to negotiate with their organization, the Society of Designing Engineers. A conference is scheduled for Monday, March 15. The society is asking to be recognized as the collective bargaining agency for its members.

A sitdown strike involving 1200 employes, according to union figures, was started March 4 in four plants of the Bohn Aluminum & Brass Corp. and forced the closing of three others.

Brief strikes were staged at the

plants of the Detroit Stamping Co. and the Acme Die Casting Co. March 5, both being settled promptly by agreement of managements to negotiate. A five-day strike at the O & S Bearing Co. was settled March 6 when the union was given recognition for six months and a substantial increase in wages given. An eight-hour strike of less than 60 employes at the Holley Carburetor stamping department March 5 was settled with the UAW recognized as bargaining agent for its members. Peninsular Metal Products ended a 12-hour strike with a sole bargaining agreement and wage increases.

The Timken-Detroit Axle Co.'s plant, held by 600 sitdown strikers since Feb. 24, was evacuated March 6 when an agreement was reached after a two-day conference between the management and officials of the UAW. The agreement provided for seniority, exclusive bargaining rights to the union for six months, minimum hiring wage of 65 cents for men and 60 cents for women with rates increased to 75 and 65 cents respectively after 60 days, no discrimination and negotiation on such disputes as exist, neither side to break off negotiations for 45 days unless agreement is reached. Points to be taken up in the negotiations include the union's demands for wage adjustments for skilled employes, abolition of piecework, eight-hour day and 40-hour week with time and a half for overtime. The plant resumed operations last Monday.

The Zenith Carburetor strike also ended March 6 after questions of wages and hours had been settled. Further arbitration is to be held in two weeks on the question of union recognition. Operations were resumed Monday.

A settlement of the Thompson Products strike was reached March 5. The UAW was given sole bargaining rights for six months and minimum wages were increased to 75 cents for men and 65 cents for women, from 56 and 33 cents respectively. Time and a half will be paid for work in excess of 44 hours a week.

Settlement of the sitdown strike of 150 men at the Advance Stamping Co. was announced by the union March 9. The UAW was granted sole collective bargaining rights; minimum rates of 65 cents an hour for women and 75 cents for men were established; night workers were given a five-cent hourly differential; a 40-hour week established with time and a half for overtime; and piece work was abolished.

A sitdown strike of some 500 workers was started March 9 in the plant of the Yale & Towne Mfg. Co. in Detroit, precipitated, according to the union, by refusal to recognize the UAW and failure of some of the workers to receive wage increases promised under an agreement reached after a short strike two weeks ago.

The UAW announced unionization of the Nelson Bros. Foundry in Saginaw employing 350 workers, said to be the first successful attempt in that city where unions have been opposed by a vigilante committee. Agreement provided for wage increases of 5 to 15 cents an hour and recognition of the union for its members.

H. L. Weckler

vice-president and general manager of the DeSoto division, Chrysler Corp., and member of the executive staff.

Maryland Workers Support Measure to Outlaw Sitdowns

Numerous employes of the Chevrolet and Fisher body plants in Baltimore appeared before the Judiciary Committee of the House of Delegates, in the Maryland General Assembly, on March 9 and urged that a bill which would outlaw sitdown strikes be enacted. The bill was introduced recently and the hearing was the first held by the committee. One of the delegates attending the hearing made the charge that some of those urging passage of the bill were seeking to have the General Assembly go on record as opposed to the CIO.

Spokesmen for the passage of the bill said they represented about 2400 employes in Baltimore and that it should be made illegal to permit a few sitdowners to throw hundreds of employes out of work. They also contended that the words "sitdown strike" should be used in the law to make the strikers realize that such forms of strikes are illegal.

Sheriff Comes— Strikers Leave

Sitdown strikers evacuated the Attwood Brass Works at Grand Rapids, Mich., last week when a sheriff and his deputy started to serve warrants on the 35 men in the plant. The strikers avoided a service of the papers and went quietly to their homes. The plant reopened Monday and the company announced it had not signed an agreement with the UAW.

Firestone Still Closed

No Yielding to Rubber Workers' Demand for Closed Shop

Ten thousand employes of the Firestone Tire & Rubber Co., of Akron entered their second week of enforced idleness as officials of the United Rubber Workers Union of America, a CIO affiliate, continue to press their demands that the URW be recognized as the sole collective bargaining agency for all Firestone workers. The Firestone management has given no indication of yielding to the demand and everything points to a protracted siege with all production in the Firestone tire, battery and wheel and rim plants at a complete standstill.

The situation at Firestone is unique in several ways. The present situation is not a sitdown but rather a walkout, although it started from a small sitdown a week ago, inspired by two union women who refused to pass materials on to non-union workers in the tire department. None of the Firestone factories is being picketed, the company having stated that production will be at a standstill pending negotiations with the union. It is also indicated that most office employes will be given "vacations," with only skeleton office and maintenance crews in the plant.

While the Firestone Akron factories remain idle the company has speeded up production, it is reported, in its California factory, where it can, under pressure, produce upwards of 10,000 tires a day. As Firestone furnished more than 50 per cent of all Ford original equipment tires, this California capacity probably will be concentrated, in so far as equipment permits, on Ford tires for the time being.

Should the Firestone emergency spread and involve other Akron tire manufacturers, it is stated upon reliable authority that these manufacturers could close their Akron factories indefinitely and depend upon their subsidiary plants and their current inventories to meet the normal replacement demand for a period of several months. It is estimated there are now more than 20,000,000 tires in the country—the largest inventory on record. These stocks are scattered all over the country so as to be free from the menace of possible labor blockade.

Other Akron plants continue to operate normally with the possible exception of Goodrich, which has had a new epidemic of minor sitdowns. Judging from past experience, Goodrich, in the event of any real sitdown threat, may be expected to close its Akron factories indefinitely. It has used this procedure on several occasions.

Closing of the Chrysler and Hudson factories will affect production at Goodyear, which furnishes all Chrysler and Hudson original equipment tires. Shipments to Chrysler have been running nearly half a million tires monthly, and to Hudson between 30,000 and 40,000 a month.

GM Sales Off in February

Strike Cut Total Shipments but Retail and Export Sales Were Higher for First Four Months of New Model Year

February sales of General Motors cars suffered from strikes that had closed most of the corporation's plants. Shipments to dealers in the United States and Canada, together with shipments overseas, totaled 74,567 compared with 144,874 in February last year. Sales in January were 103,668. Sales during the first two months of 1937 totaled 178,235 compared with 303,446 for the same two months of 1936.

Sales of General Motors cars to consumers in the United States totaled 51,600 in February compared with 96,134 in February a year ago. Sales in January were 92,998. Sales for the first two months of 1937 totaled 144,598 compared with 198,168 for the same two months of 1936.

Sales of General Motors cars to dealers in the United States totaled 49,674 in February compared with 116,762 in February a year ago. Sales in January were 70,901. Sales for the first two months of 1937 totaled 120,575 compared with 247,896 for the same two months of 1936.

The accompanying table gives further details of General Motors sales:

	Feb., 1937	Jan., 1937	Feb., 1936	First 4 Months of Model Year 1937	First 4 Months of Model Year 1936
Sales to world dealers	74,567	103,668	144,874	609,069	671,898
Sales to U. S. dealers	49,674	70,901	116,762	473,681	545,755
Sales to U. S. consumers	51,600	92,998	96,134	473,622	457,225
Change in U. S. dealer stocks	—1,926	—22,097	+20,628	+59	+88,530
Sales to foreign dealers	24,893	32,767	28,112	135,388	126,143

78% More Planes Built

U. S. Aircraft Production Reached 3006 Last Year

An increase of approximately 78 per cent in the total number of airplanes manufactured in the United States in 1936, and of 66 per cent in the number of light airplanes of the private owner type, is shown in aircraft production figures for the year made public by the Bureau of Air Commerce, Department of Commerce.

The total of all aircraft produced was 3006 in 1936 as against 1691 for 1935. The increase is particularly noticeable in small civilian airplanes of the types suitable for private owners. The greatest increase in this classification occurred in the number of two-place cabin land monoplanes produced. In 1935 there were 458 manufactured while 938 were constructed in 1936. The number of three-place cabin land monoplanes increased from 83 in 1935 to 96 in 1936.

Of the total 1936 production, 1637 aircraft were for domestic civil use, 858 were for delivery to military establishments, and 511 were exported.

The industry produced 1433 monoplanes and 204 biplanes. There were 131 companies or individuals producing airplanes for domestic civil use during 1936. Of these, 14 companies manufactured 20 or more planes each or approximately 90 per cent of the total for domestic civil use; 15 companies built 2 to 14 planes each, and 102 companies or individuals produced only one each or approximately 6 per cent of the total produced for domestic civil use.

L. R. Baldock

L. R. Baldock, assistant treasurer of the Timken-Detroit Axle Co., Detroit, died March 3 after a brief illness. He became well known in the automotive industry during his 17 years of association with the Timken organization.

Mr. Baldock was born in Canton, Ohio, Nov. 20, 1894. During the World War he served with the United States Army Signal Corps. In 1919 Mr. Baldock joined the Timken Foundry Co. at Canton and three years later was transferred to the Detroit plant, where he held numerous responsible positions.

46% of Ford Plant Scrapped In Eight Years, Cameron Says

In the last eight years Ford Motor Co. scrapped 46 per cent of its plant, William J. Cameron stated last Sunday on the Ford broadcast. The actual value involved was $175,000,000 and was replaced with $217,000,000 of new equipment.

"Had the company been money-minded and 'saved' that $217,000,000 by replacing little or nothing new during the last eight years, the public would literally have lost that $217,000,000 by being deprived of the values which that sum should have brought into existence," Mr. Cameron declared.

Pointing out that all industry benefitted by this spending program, Mr. Cameron declared that Ford workers were helped by receiving a blanket wage increase of a dollar a day during two years of the depression and were the first in large industry to return to the full minimum wage rate, 100,000 individual wage increases amounting to an average of $141 a man were made in 1936, and payrolls were increased by $45,000,000.

Rayon Found to Give Higher Mileage for Bus, Truck Tires

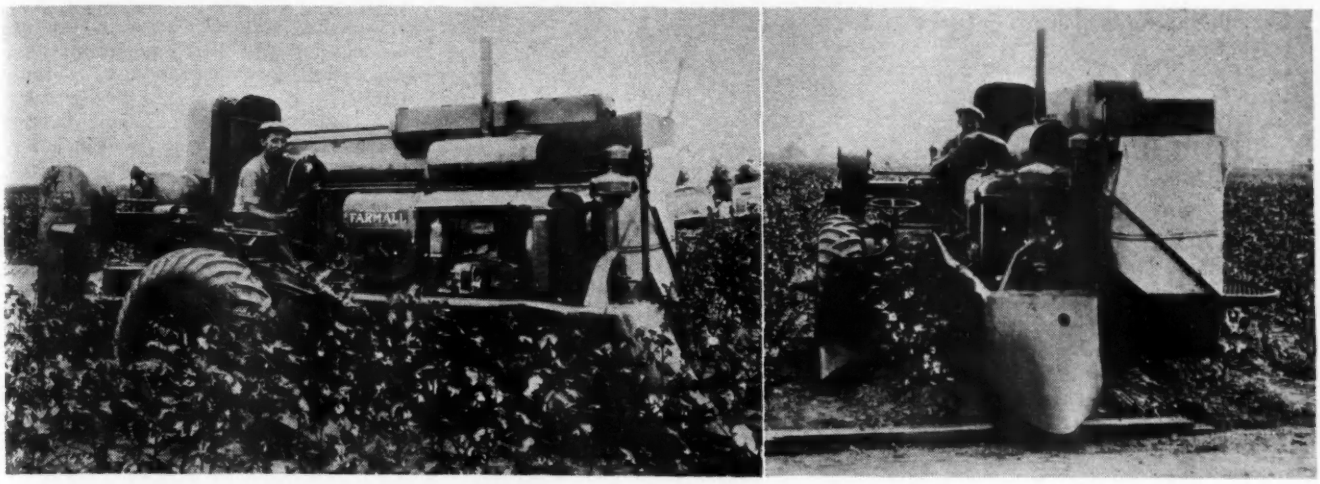
The use of cellulose rayon cords in place of cotton cords in heavy duty truck and bus casings, as jointly announced March 2 by Goodyear and United States Rubber Co., may mean the eventual replacement of cotton by rayon on all truck and bus tires, according to opinions of tire industry ob-

Comparison of Railroad and Motor Vehicle Tax Rates

(Courtesy National Highway Users Conference)

	1932	1933	1934	1935	Increase or Decrease 1932 to 1935 (Per Cent)
Valuation all Motor Vehicles [1]	$4,543,767,472	$4,023,476,189	$4,970,723,392	$4,746,272,622	4.5
Total Federal, State and Local Taxation [2]	1,037,284,000	1,200,174,000	1,264,729,000	1,286,157,907	24.0
Rate of Taxation (Per Cent)	22.8	29.8	25.4	27.1	18.9
Valuation all Motor Trucks [3]	$636,789,000	$588,412,000	$704,369,000	$721,157,593	13.2
Total Federal, State and Local Taxation [4]	252,319,000	290,157,000	308,828,000	329,900,000	30.7
Rate of Taxation (Per Cent)	39.6	49.3	43.9	45.75	15.5
Valuation all Railroad Property (Class I) [5]	$23,583,293,000	$23,300,399,000	$23,073,038,000	$23,001,611,000	2.4*
Total Railroad Tax Accruals (Class I) [6]	275,135,399	249,623,190	239,112,982	238,371,831	13.4*
Rate of Taxation (Per Cent)	1.17	1.07	1.04	1.036	11.4*

[1] American Automobile Association.
[2] U. S. Bureau of Public Roads and Bureau of Internal Revenue.
[3] National Highway Users Conference estimate based on data from American Automobile Association and the Automobile Manufacturers Association.
[4] Automobile Manufacturers Association, "Motor Truck Facts" 1935 Edition. These totals do not include personal property taxes on trucks.
[5] Includes investment in railway property, materials and supplies, and cash, less accrued depreciation. Interstate Commerce Commission, Statistics of Railways in the United States.
[6] Interstate Commerce Commission, Statistics of Railways in the United States.
* Decrease.



The picker unit side of a 1936 model McCormick-Deering Farmall cotton picker is shown at the left. This spindle type machine, built by the International Harvester Co., has undergone extensive tests on a plantation near Clarksdale, Miss. At the right is a front view. The cleaner is mounted on the left of the machine.

servers and engineers. While the use of rayon in place of cotton increases the cost of the truck or bus tire by some 30 to 35 per cent it more than proportionately increases the mileage potentialities of such tires, with these tires capable of giving four to five times the mileage of standard truck and bus tires, it is claimed. This higher mileage potential makes rayon tires especially suitable for long distance high-speed truck and bus operations, it is stated.

It is understood that while Goodyear holds the patents on the process of treating the rayon cords with cellulose to increase their heat-resisting qualities, U. S. Rubber Products, Inc., is using a similar process under an interchange of patents. It is also understood the Goodyear process is to be licensed to other manufacturers.

IHC Develops Cotton Picker

Mounted on a Farmall Tractor, the Single Row Machine Has 480 Spindles and Picks Half an Acre per Hour

While the machine is not yet available for sale, a great deal of interest is being shown in the latest model McCormick-Deering Farmall cotton picker built by the International Harvester Co. It is a single-row machine mounted on the Farmall tractor and was developed by E. A. Johnston, vice-president in charge of engineering, and his assistants. Last season it was given very thorough tests on a plantation near Clarksdale, Miss., and its performance is reported to have been quite satisfactory. It is possible that during the next year the usual International Harvester procedure may be followed and a number of the machines placed with mechanically minded cotton growers for additional tests in non-expert hands. Only after these have proved successful will the machine be marketed.

The IHC cotton picker, shown in the accompanying illustrations, is provided with vertical and parallel revolving cylinders between which the cotton plants pass as the machine moves forward along the cotton rows. From each cylinder protrude 240 spindles, 480 of them in all, each of which has numerous tiny hooks or barbs that catch the lint. The cotton is removed from the spindles by doffers which travel much faster than the spindles and which are equipped with brushes that keep the spindles clean. The cotton is then passed to the cleaning equipment placed to the left of the operator driving the tractor. Another operator, at the front left of the machine, tends to the bags which receive the cotton as it comes from the cleaner.

Referring to the need of cleaning mechanically picked cotton, Mr. Johnston says: "The possibility of developing a mechanical picker which will gather the cotton as free from leaves and trash as good hand picking seems very doubtful, consequently the cleaning of mechanically picked cotton to produce grades equal to hand picked cotton is of greatest importance." Mr. Johnston said that experiments have been made with many types of cleaners, both stationary and mounted on the tractor. It will be necessary, in his opinion, to augment cotton gin cleaning equipment for the mechanically picked fibers; a problem that should not prove difficult to solve.

Under relatively favorable conditions, the single-row picker will cover approximately one-half acre per hour. A two-row picker of the same design will cover approximately one acre each hour. The acreage that can be picked is fairly constant and the amount of cotton harvested depends on the yield. While there are hand pickers who can pick several hundred pounds per day, the average is less than 150 lb. With a yield of one-half bale per acre the single-row picker therefore has a capacity of about one-fourth bale an hour, equal to the capacity of 20 to 25 average hand pickers, each picking 150 lb. or less a day. In cotton fields yielding two bales to the acre, the same machine has a capacity equal to that of 80 to 100 average pickers. The two-row machine will have approximately double the efficiency of the single-row machine.

The possibility that mechanical cotton pickers will in the near future be produced and sold in quantities which will revolutionize agriculture in the South is scoffed at by Mr. Johnston. "Obviously, a successful mechanical cotton picker will replace a certain amount of hand labor," he says, "but the final development, production and use of the picker will come very slowly. For many years to come only the larger cotton growers will be able to use the mechanical pickers profitably."

England to Regulate Tourist Trailer Camps

An act restricting the freedom of camping and caravanning has been passed in England. After October it will be necessary for public sites to be licensed by local authorities; farmers also will have to obtain licenses if they wish to allow more than one caravan at a time to rent parking space.

This legislation is aimed at suppressing the many over-crowded, untidy and unhygienic camping and carvanning grounds that have sprung up all round the coast and in many rural areas during the past two or three years, the majority of them having no proper water or sanitary arrangements.

It has also been decided to recognize certain touring, camping and caravanning clubs as suitable authorities to approve or disapprove of sites, independently or in collaboration with local authorities.

British Output Rises

December Car Production 27½% Above December, 1935

In the monthly progress report of the British Society of Motor Manufacturers just issued, it is shown that almost a record percentage increase in production of passenger cars occurred in December last, the total for the month (34,349) being 27.5 per cent above that of December, 1935. During the first three months of the statistical year commencing Oct. 1, the increase was 16.2 per cent.

Truck and bus production also showed large percentage increases for both December and the three months ended Dec. 31, these being 26.8 for the month and 29.1 per cent for the three months.

Exports of passenger cars during the 12 months ended Dec. 31 increased by approximately 20 per cent, consisting of 64,787 units valued at £6,885,074 against 54,260 valued at £6,357,504 during 1935. Truck and bus exports increased by approximately 24 per cent; from 13,642 units valued at £2,554,927 in 1935 to 16,926 valued at £3,150,232 in 1936.

January exports of passenger cars numbered 6489 against 4540 in January, 1936, an increase of 43 per cent, while those of trucks and buses increased by 38 per cent (1846 against 1337).

Imports of complete passenger cars last year were fewer in number than in 1935, falling from 12,331 to 11,452, but chassis (both cars and trucks) were up slightly from 3006 to 3244.

New York's Price Fixing Act Now Upheld by Court

The New York State Court of Appeals upheld the constitutionality of the state's "fair-trade" act, which permits manufacturers to fix by contract the retail price of their trade-marked products, in a decision handed down March 9. The decision, which reversed previous rulings of the court, was based on the U. S. Supreme Court decision upholding the Illinois and California fair trade laws which are practically identical with the New York law.

Resale Price Fixing Bill Approved by House Group

Favorable reports was made March 9 by the House Committee on the Judiciary on the Miller-Tydings resale price maintenance bill. Unavailing effort was made by opponents to amend the bill, but the measure went to the House without a record vote in committee. Representative Celler, of New York, opposed to the measure, expects to continue opposition when it is taken up by the Senate Committee on the Judiciary. It is now before a subcommittee of the Senate committee. The general view is that the bill will be enacted by both branches of Congress at the present session without any substantial change. Representative Celler has proposed an amendment which would give the Federal Trade Commission authority to investigate contracts under the proposed act and to issue cease and desist orders if practices were found to be unreasonable. In a recent letter to the commission Representative Celler asked for an investigation of resale price activities of a number of trade associations.

Raymond W. Young

assistant engineer of the Wright Aeronautical Corp., was awarded the 1936 Manly Memorial Medal at the SAE National Aeronautic Meeting Banquet in Washington this week.

SAE Air Session Opens

Visit to Aeronautical Laboratories Features Engineers' Meeting

Well over a hundred air-minded engineers and executives converged on the Mayflower Hotel, Washington, D. C., on Thursday, March 11, to attend the National Aeronautic Meeting sponsored by the SAE and its Washington section.

A special feature of the two-day session was an inspection trip through the National Bureau of Standards laboratories. The visiting group was divided into two sections, one inspecting the laboratories devoted to aircraft engine research, the other covering laboratories where studies of vibration, fatigue failures and aerodynamics are conducted. At the banquet held on Friday evening, at which C. H. Chatfield acted as toastmaster, Raymond W. Young, assistant engineer of the Wright Aeronautical Corp., was awarded the 1936 Manly Memorial Medal for his paper "Air-Cooled Radial Aircraft-Engine Performance Possibilities," presented before the society's annual meeting at Detroit on Jan. 17. Presentation of the medal was made by Dr. George W. Lewis, director of aeronautical research, National Advisory Committee for Aeronautics, himself a recent winner of the Daniel Guggenheim Aeronautic Medal for his researches in aeronautical science. Major speaker of the evening was Arthur Nutte, Wright Aeronautical Corp., who delivered a talk on European aviation engines.

Hupp Stockholders' Meeting To Consider New Financing

The board of directors of Hupp Motor Car Corp. has notified the New York and Chicago Stock Exchanges of a record date of March 20, 1937, for a special meeting of stockholders. After complying with the regulations of the exchanges, new plans for refinancing the company will be announced to stockholders.

:SLANTS:

AIR PASSENGERS—*Air lines operated by American companies (domestic and foreign extensions) carried* 1,147,969 *passengers and* 8,350,010 *lb. of express during* 1936, *the Bureau of Air Commerce has announced. In* 1935 *the lines carried* 860,761 *passengers and* 5,511,737 *lb. of express. Miles flown by all scheduled operators last year were* 73,303,836, *compared with* 63,540,233 *in* 1935. *There were* 380 *airplanes in operation on the lines at the end of the year;* 9972 *persons were employed; and* 37,057,069 *gal. of gasoline and* 871,663 *gal. of oil were consumed.*

WATER TAXIS—*Public service motor launches in the city of Venice have been combined in a corporation known as the "Motoscafi Riuniti." Telephones have been installed at various points so that patrons can call for a water taxi just as in other cities they call for taxicabs. The new arrangement is expected to provide a more efficient and less expensive service. There are at present 33 launches in the Venetian taxi service.*

TRAILERS FOR ARABS—*The Shaikh of Kuwait, locality on the Persian Gulf, wants a trailer in which to live during his desert hunting trips, according to a letter received by Silver Dome, Inc., Detroit. "The trailer should be a two-wheel unit which would pull easily behind a light car over open desert country, practically without roads. Illustrated matter would be of special value as the prospective purchaser cannot read English," the letter states.*

Studebaker Earns $1 per Share

Last Year's Sales Best Since 1929; Greater Net Profits Reported by Many Automotive Concerns

During its first full year since reorganization the Studebaker Corp. earned a profit in 1936 of $2,187,783, equivalent to $1.01 a share on stock outstanding at the end of the year, according to the annual report just released. Sales for 1936 aggregated $68,928,724 and were the greatest for any year since 1929.

These figures compare with net sales of $33,837,892 and net loss of $1,975,622 for the period from March 9 to Dec. 31, 1935. The Studebaker Corp. of America was succeeded on March 9, 1935, by the present organization.

Studebaker sales of passenger cars and trucks totaled 91,999 units in 1936 against 54,649 in the full year 1935. Sales were the best since 1929 when the total was 97,529. According to the annual report, published registrations of new passenger cars in the United States show that Studebaker registrations increased 71 per cent in 1936, as against 24 per cent for the industry. A substantial part of the credit for the improvement in sales volume and financial results may be given to the early introduction of 1937 models, which were announced in September, or about three months earlier than the year before, it is stated by Paul G. Hoffman, president of the corporation, in a letter accompanying the report.

More trucks were sold by the corporation during 1936 than during any previous year in its history. Registrations of new Studebaker trucks in the United States showed an increase of 56 per cent for 1936, against a 20 per cent increase for all makes of trucks, according to the letter.

Financial position of the company was strengthened during 1936. Current assets on Dec. 31, 1936 totaled $16,392,829, including cash of $7,129,837, against current liabilities of $5,271,170, leaving a net working capital of $11,121,659. At the end of 1935 current assets totaled $13,536,037, including cash of $5,160,352, as compared with current liabilities of $6,777,451, leaving net working capital of $6,758,586. Earned surplus was at $212,160 in the 1936 year-end balance sheet, replacing a deficit of $1,975,622 as of Dec. 31, 1935.

The **International Harvester Co.** reports net profits for 1936 as $29,760,000 against $19,618,238 for 1935. Sales were $254,934,000 or 17 per cent more than in 1935 and 24 per cent less than in the peak year of 1929.

Autocar Co. reports net income of $163,695 for 1936 contrasted with a loss of $164,812 in 1935.

Continental Motors Corp., for the three months to Jan. 31, 1937, reports a net loss of $36,414 after depreciation and $15,755 developement expenses. Net loss in the same period last year was $48,003. Net profit for January, 1937, was $9,460.

The audited annual statement of **Borg-Warner Corp.** for 1936 to be published within the next few days, will show net earnings of $8,326,865 after all deductions, including depreciation, Federal income taxes and undistributed profits taxes. After allowing for dividends on preferred stock, this will show net earnings of $7.13 per share on the common stock issued and outstanding as of Dec. 31, 1936, exclusive of the stock held in the treasury of the company. Net earnings for the year 1935, after allowing dividends on preferred stock, amounted to $5.89 per share on the common stock. The regular quarterly dividend of $1.00 per share was declared on the common stock. This dividend is payable April 1, 1937, to stockholders of record March 16, 1937. All outstanding preferred stock was retired Feb. 1, 1937.

The Budd Wheel Co. reports a net profit of $796,338 for 1936 after all taxes and charges, compared with a net profit of $784,444 in 1935. Current assets are listed at the end of 1936 as $3,156,031 and current liabilities were $1,435,710.

The Edward G. Budd Manufacturing Co. reports a net profit for 1936 of $991,271 after taxes and charges and including a nonrecurrent income of $635,970 as a result of the sale by Budd International Co. of its interest in the Pressed Steel Co., Ltd. This compares with a net profit of $743,412 in 1935. Current assets are listed at $9,501,188 and current liabilities at $2,783,776.

United Aircraft Corp. reported net income for 1936 of $1,926,442 or 80 cents a share on the average amount of stock outstanding. The net income included $309,727 representing profit on the sale of stock of Pan American Airways. For 1935 net income was $434,635 or 21 cents a share. Sales were $22,303,421 against $11,885,506 in 1935. The company said it believed that aircraft motor horsepowers would move upward from 1000 to 2000 and even higher in special cases. It expected that Pratt & Whitney Aircraft, which has been doing development work, would be in the forefront of this new market.

Bohn Aluminum & Brass Co. reports 1936 net profit of $1,579,901 after surtax on undistributed profits against $1,588,827 in 1935.

Murray Corp. of America and subsidiaries report 1936 net profit of $907,390 before surtax on undistributed profits against $1,430,352 in 1935.

JO. G. ROBERTS, a pioneer in the automotive business, has been placed in charge of the Nash Philadelphia Co., distributor for Nash cars in Pennsylvania and New Jersey. Mr. Roberts was with Nash from 1920 to 1934 when he left to become code chief of the automotive section of NRA.

C. P. TURNER, who has been in charge of the Nash Philadelphia Co., has returned to the Nash Motors Co. sales organization.

ROBERT A. WEINHARDT, well-known member of the SAE and formerly assistant chief engineer of the Reo Motor Car Co., has been appointed to the engineering staff of the W. M. Chase Co. where he will devote himself to thermostatic bimetal problems of the automotive industry.

RAYMOND BECK, formerly secretary and field director of the American Automobile Association, and more recently supervisor of the U. S. Reemployment Service for the State of New York, has been appointed field representative of the Made in America Club, Inc.

J. J. TURNER has been appointed sales manager of the trailer division of the Federal Motor Truck Co. Mr. Turner has been closely associated with the trailer business since its beginning, both from a wholesale and retail standpoint.

Chevrolet's battery package won first honors in the annual Wolf Awards competition.

EDSEL B. FORD has been reappointed by Mayor Couzens to the Detroit Arts Commission. His new term will expire March 1, 1941.

CIT Business Gains

Increased Receivables Offset Lower Profit Margin

Business volume of Commercial Investment Trust Corp. for the first two months of 1937 showed a very substantial gain over the same period in 1936 and the net profit margin has been maintained, it was disclosed at the annual meeting of stockholders in New York, March 9. Gross profit margin has been reduced somewhat by rate reductions, but the increase in purchases of receivables has fully offset this.

Stockholders at the meeting approved a reduction in share capital through cancellation of treasury common stockholdings. They also approved elimination of authority to issue 6½ per cent preferred stock which has never been outstanding.

The company is still able to borrow at very low rates of interest, not more than 1½ per cent for current requirements. It has not yet felt a firming of the money market. The company believed it was good insurance to pay 3 and 3½ per cent for longer term money while the funds could be had in 1936.

Dispute between the Federal Trade Commission and the various companies in the motor finance field over the use of the term "6 per cent plan" is expected to be ended within a few days, it was stated.

At the meeting it was reported that banks have made a strong effort to win some finance business from the finance companies, but that the very nature of the bank method, which is to intercept a borrower on his way to the automobile dealer makes it improbable that banks will make any large dent in the total business.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

General business activity held steady last week, and the outlook has been brightened by the announcement of several wage increases. The business index compiled by the *Journal of Commerce* stood at 101.8, the same as in the preceding week, as compared with 82.6 for the corresponding period last year. Spring buying was active, and gains above last year's figures ranged from 14 to 30 per cent. Mill and factory payroll increases in New England had the effect of stimulating retail trade, which advanced from 15 to 22 per cent above that a year ago.

Carloadings Slightly Lower

Railway freight loadings during the week ended Feb. 27 totaled 696,727 cars, which marks a decline of 18,157 cars below those in the preceding week, a gain of 23,858 cars above those a year ago, and a rise of 92,396 cars above those two years ago.

Power Output Holds Gains

Production of electricity by the electric light and power industry in the United States during the week ended Feb. 27 was 13.7 per cent above that in the corresponding period last year.

Lumber Business Better

Lumber production during the week ended Feb. 20 stood at 56 per cent of the 1929 weekly average. For the second successive week following the settlement of the martime strike shipments were the highest since last October. New orders declined slightly, but production advanced further.

Farm Prices Higher

According to the Bureau of Agricultural Economics, the index of prices received by farmers on Feb. 15 stood at 127, as compared with 131 a month earlier and 109 a year ago. On the other hand, the prices of commodities purchased by farmers advanced. The index of these prices stood at 129, as compared with 128 a month earlier and 122 a year earlier.

Petroleum Output Steady

Average daily crude oil production for the week ended Feb. 27 amounted to 3,296,100 bbl., as compared with 3,295,950 bbl. for the preceding week and 2,774,700 bbl. a year ago.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended March 6 stood at 91.1, as compared with 90.9 the week before and 91.0 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended March 3 showed an increase of $3,000,000 in holdings of discounted bills. Holdings of bills bought in the open market and of government securities remained unchanged. Money in circulation increased $3,000,000, and the monetary gold stock rose $18,000,000.

Notes from Nippon

Ikegai Executives Visit U. S.

For the purpose of inspecting leading automotive plants, Saburo Ikegai, one of the heads of the Ikegai Works, left Yokohama recently for Seattle in company with Tsutomu Hayasaka, engineer. The two Ikegai men expect to spend about six months abroad extending their inspection trip from American to Germany, France, England and Italy.

The Ikegai Works are Japan's leading makers of machine tools and have been making Diesel engines since 1915. Since 1934, the company has been manufacturing two sizes of high-speed Diesels for trucks. The firm is also supplying Diesel units for railroad purposes.

Gas Generators Not Popular

Charcoal gas generators, the installation of which is being encouraged by the Japanese Government and military circles, are reported to be finding a broadening market overseas. Siam and Manchukuo rank among the more important customers, probably because the price of gasoline in those countries is high.

There are many fully tested models, such as the "Shirato," the "Suzuki," the "Miura," and the "Kobayashi" generators. The "Suzuki" is recommended for pleasure cars and taxis.

Notwithstanding official encouragement, the Japanese are not readily taking to these appliances. With the imposition of the 10-sen import and consumption taxes on gasoline beginning in April, the use of charcoal generators in the domestic market is expected to increase.

Nissan Jidosha Expands

The Nissan Jidosha Co. of the Nihon Sangyo has decided to finance an expansion of its plant now in progress by means of capital increase and further borrowing.

The present capital stock of 10 million yen will be increased to 30 millions. Advances to the amount of 8 million yen will be made by the Industrial Bank, the Yasuda Bank and the Mitsui Trust Co. These loans together with the outstanding amount of 3 million yen will eventually be converted into debentures.

The Nissan Jidosha, which has planned an extension of its mass car production facilities, has already purchased a site in Ibaragi prefecture and 3 million yen worth of new imported machinery has been ordered. The new plant will be mainly used for the production of standard passenger cars, while the Shinkoyasu factory near Yokohama will build the baby car line.

To Standardize Air Engines

With a view to unifying the domestic airplane industry, the Ministry of Communications is preparing the Aviation Industry Law. One of the items of the draft bill concerns the standardization of all parts including fuselage and engine.

Bendix Sales Convention At South Bend May 25-28

Announcement that the annual sales convention of the Bendix Products Corp. will be held in South Bend, Ind., May 25-28 has been made by Frank B. Willis, vice-president in charge of sales. More than 600 Bendix distributors are expected to attend the convention, coming from all parts of America and Canada.

Toledo UAW Local Looks After Messenger Boys

United Auto Workers Local No. 14 in Toledo is negotiating on behalf of an organization of 65 Western Union and Postal telegraph messenger boys who went on strike Monday.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

Foreign Notes

The Imperial Victorian Exhibition to be held at Crystal Palace, London, in May, will comprise a motor vehicle section as it did last year.

Hiram S. Maxim, of flying machine fame, is at work on a gas engine which can be regulated and reversed like a steam engine. He is also endeavoring to produce a light steam engine and boiler for boat and vehicle use.

Several French inventors are bringing out motors that may be attached to present styles of vehicles and thus save owners the expense of buying new vehicles complete. The large cab and delivery companies of Paris are particularly anxious to secure a practical motor of this class.

A Benz motor carriage was recently imported into Prestoria, South Africa, by Hess & Co., commission merchants of that place. President Kruger took a ride in the new conveyance and was so pleased with it that he presented to the importers a gold medal suitably inscribed.

From *The Horseless Age*, March, 1897.

Automotive Metal Markets

Following the Price Advances in Steel, Speculative Activity Seizes All Branches of Non-Ferrous Markets

By William Crawford Hirsch

Not since the War Industries Board set up price dictation 20 years ago to cope with the then prevailing speculative chaos have consumers been confronted with such dislocation of the moorings in all divisions of the metal market as was the case this week. Coming on top of announcements of sharply higher prices for all descriptions of finished steel, a spectacular upsurge of non-ferrous metal prices, tin, copper, lead and zinc, at the beginning of the week enhanced the perplexity of buyers.

While steel mills turned every possible wheel to work off their commitments at lower prices, American Iron & Steel Institute figures showing a 1¾ per cent increase in the rate of capacity in operation, the placing of second quarter tonnage business at higher prices appeared to be in abeyance. In fact, some automotive buyers let it be known that they could see no advantage in anticipating their requirements at this stage of market developments. Another retarding factor was that mills had not completed their price lists, covering all products.

Renewed suspensions of shipping orders, due to fresh strike outbreaks, also acted as a mild damper on bullish enthusiasm. Automobile sheets were advanced $6 a ton; hot rolled strip, $5; and cold rolled strip, $8 a ton. Carbon steel bars are up $5 and alloy bars up $6 a ton. Cold finished steel bars were advanced $7 a ton by one of the specialists in that line. With considerable difference in the attitude of steel producers toward the labor problems of their industry, it remains to be seen whether their price policies in the future will be as uniform as they have been in the past.

Denuding of the scrap supply by foreign buyers continues unabated, steamer after steamer being chartered to carry scrap cargoes abroad, the American steel buyer being the sufferer.

Pig Iron—Following an advance of $1 a ton in February, blast furnace interests tacked another $2 per ton onto their price, bringing the second quarter base price to $24 in most Middle West markets. Sellers held back booking business in February and consider themselves in excellent position now to obtain the higher price, believing that stocks in automotive foundries are running light. The advance in 1937 ore prices is expected to exceed 50 cents a ton.

Aluminum—Advances in secondary aluminum prices overhang the market.

Copper—One of the large producers sold a round tonnage of electrolytic copper on Monday at 16¼ cents, whereupon others quoted the same price, 1¼ cents higher than the nominal quotation of 15 cents of last week and marking a 75 per cent advance over a year ago.

Tin—Wild inflationary speculation in London drove the price of spot Straits tin up to 60 cents at the opening of this week's trading. This compares with 58 cents at the close of last week's business, 50⅝ cents a month ago and 48½ cents a year ago. The statistical position of the metal in no way explains so phenomenal a rise, visible supplies having increased rather than otherwise. The British government has let it be known that no restriction of speculation is intended. The higher tin goes, the deeper the Germans and Italians have to dig into their pockets.

Lead—At Monday's price of 7¼ cents, lead completed an advance of $25 a ton since the first of the year.

Zinc—Zinc prices advanced $10 a ton on Monday. The price is now 50 per cent over that of a year ago.

Stock Sales Reported By Motor Executives

The Securities & Exchange Commission's January reports of stock trading by officers and directors included the following deals by persons interested in automotive concerns:

Walter P. Chrysler gave away 40 shares of Chrysler Corp. stock and held 109,682. W. L. Mitchell of the Chrysler Corp. gave away 200 shares and held 900.

Martin L. Pulcher, officer, director and large holder of Federal Motor Truck stock, sold 13,200 shares and held 55,520.

Donaldson Brown of General Motors sold 11,667 shares and held 6258, after having given away 700 in December. R. K. Evans gave away 491 shares. John L. Pratt sold 1228 and held 11,154. J. J. Schumann, Jr., gave away 125. Alfred P. Sloan, Jr., sold 12,873 shares and held 11,806.

Robert Porter, officer and director of Kinner Aircraft & Motor, bought and sold several thousand shares, ending with the net sale of 5800 and the holding of 21,013. G. Brashears through G. Brashears & Co. sold 2411 shares of Lockheed Aircraft and held 1000. R. E. Olds, formerly a director of Reo, sold 3000 shares and held 500, while G. E. Smith, officer and director, sold 1900 and held 13,066.

Calendar of Coming Events

SHOWS

Holland, Automobile Section, Royal Netherlands Fair, Utrecht..March 9-18
Switzerland, 14th International Exposition, Automobiles, Motorcycles and Bicycles, Geneva.....March 12-21
Algiers Fair, Automobile Section, Algiers .....March 20-April 4
Portugal, 11th Automobile Salon, Porto March 27-April 5
Yugoslavia, 14th Automobile Salon, Zagreb .....April 17-26
Illinois Automotive Ass'n, 4th Annual Show and Maintenance Exhibit, Navy Pier, Chicago .....Apr. 24-28
Poland, Automobile Salon—16th International Fair, Poznan .....May 1-10
Norway, Automobile Salon—Oslo..May 7-10
Second Annual Automobile Maintenance Show, San Francisco..May 20-23
Morocco, Automobile Section, Tangier Fair, Tangier .....June
France, Automobile Section, Bordeaux Fair, Bordeaux .....June 13-28
Belgium, First International Aeronautical Salon, Brussels ...June 18-30
Fourth ASTM Exhibit of Testing Apparatus and Related Equipment, New York .....June 28-July 2
Poland, Automobile Salon (Foire Orientale), Lwow .....Sept. 1-15
France, 31st International Automobile Salon, Paris .....Oct. 7-17
Great Britain, 31st International Automobile Exposition, London...Oct. 14-23
National Automobile Show, New York, Oct. 27-Nov. 3
Italy, 10th International Automobile Salon, Milan .....Oct. 28-Nov. 8
Buffalo, N. Y., Automobile Show, Oct. 30-Nov. 6
Cincinnati Automobile Show .Oct. 31-Nov. 6
Great Britain, 13th International Commercial Automobile Exposition (trucks and buses), London..Nov. 4-13
Chicago Automobile Show .....Nov. 6-13
Akron Automobile Show .....Nov. 6-12
Brooklyn Automobile Show .....Nov. 6-13
Columbus Automobile Show .....Nov. 6-13
Detroit Automobile Show .....Nov. 6-13
Kansas City, Mo., Automobile Show, Nov. 6-13
Newark, N. J., Automobile Show, Nov. 6-13
Philadelphia Automobile Show....Nov. 6-13
Pittsburgh, Pa., Automobile Show..Nov. 6-13
Toronto, Ont., Automobile Show..Nov. 6-13
Great Britain, 36th Scottish International Automobile Exposition, Glasgow .....Nov. 12-20
Baltimore, Md., Automobile Show, Nov. 13-20
Cleveland, Ohio, Automobile Show, Nov. 13-20
Jersey City, N. J., Automobile Show, Nov. 13-20
Milwaukee, Wis., Automobile Show, Nov. 13-20
Springfield, Mass., Automobile Show, Nov. 14-20
St. Louis, Mo., Automobile Show, Nov. 14-21

CONVENTIONS AND MEETINGS

Export Managers Club, 20th Anniversary Get-Together, Hotel Pennsylvania, New York .....March 30
S.A.E. Regional Transportation and Maintenance Public Utility Meeting, Baltimore, Md.....April 15-16
International Association for Testing Materials, Second International Congress, London, England..April 19-24
S.A.E. National Tractor and Industrial Power Meeting, Peoria, Ill..April 21-23
National Machine Tool Builders' Association, Spring Convention, Edgewater Beach Hotel, Chicago....May 3-4
41st Annual Convention and Exposition of the American Foundrymen's Association, Milwaukee .....May 3-7
S.A.E. Summer Meeting, White Sulphur Springs, W. Va. .....May 4-9
National Battery Manufacturers Asso., Spring Convention, Shoreham Hotel, Washington, D. C....May 13-14
American Society of Mechanical Engineers, spring convention, Detroit, May 17-21
American Petroleum Institute, Mid-Year Meeting, Colorado Springs, Colo. .....June 1-3
Second World Petroleum Congress, Paris, France...late May—early June
Automotive Engine Rebuilders Association, 15th Annual Convention, Chicago .....June 21-24
American Society for Testing Materials, 40th Annual Meeting, New York, June 28-July 2
S.A.E. National Aircraft Production Meeting, Los Angeles, Calif....Oct. 7-9
S.A.E. Annual Dinner, Commodore Hotel, New York .....Oct. 28

CONTESTS

Indianapolis Speedway, 500-Mile International Sweepstakes .....May 31
31st Annual Grand Prix of the Automobile Club of France, Linas-Montlhéry .....July 4
Pan American Cup Race, Roosevelt Raceway .....July 5
Roosevelt Raceway, 400-Mile George Vanderbilt Cup Sweepstakes...Sept. 6
Los Angeles, 500-Mile International Sweepstakes .....Nov. 28

AMA February Sales

Member Shipments Slightly Under Jan. but 13% Above Year Ago

Factory sales by members of the Automobile Manufacturers Association in February amounted to 248,679 cars and trucks—a 13 per cent increase over the corresponding month of 1936—the association announced this week. Shipments for February were six per cent under the previous month.

On the basis of this report, January-February volume amounted to 514,502 units—a three per cent increase over the corresponding 1936 period.

February operations were 52 per cent above the five-year average and the January-February volume was 58 per cent above the five-year average.

The association's report, which covers the operations of all but one of the major producers of motor vehicles in the United States, is summarized below:

February, 1937	248,679
January, 1937	265,823
February, 1936	220,586
2 months, 1937	514,502
2 months, 1936	497,037

Nash-Kelvinator Officers Named; Nash Chairman, Mason President

At a meeting of the board of directors of Nash-Kelvinator Corp. held in Detroit March 4, the following officers were elected: C. W. Nash, chairman; G. W. Mason, president; H. G. Perkins, vice-president; C. H. Bliss, vice-president of sales, Nash Motor division; N. Erik Walberg, vice-president of engineering, Nash Motor division; H. W. Burritt, vice-president of sales, Kelvinator division; R. B. Elliott, vice-president of production, Nash Motor division; H. E. Long, vice-president of purchasing, Nash Motor division; H. A. Lewis, treasurer; H. J. Mellum, secretary; G. V. Egan, assistant secretary and assistant treasurer; G. H. Eddy, assistant treasurer; W. R. Crosett, comptroller; L. J. Holly, assistant comptroller, Nash Motor division; J. J. Timpy, assistant comptroller, Kelvinator division.

Bulletin No. 40 covering its line of special **hydraulic presses** has been issued by the Hannifin Mfg. Co., Chicago, Ill.*

Barnes-Gibson-Raymond of Detroit and Ann Arbor, Mich., has published a new catalog containing 88 pages of usable information on **spring selection and design.** In addition to data on many spring types, the B-G-R book contains calculations of actual spring design problems.*

C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., has just issued a booklet which gives complete data on its latest models of **non-indicating temperature and pressure controllers.***

A new catalog covering the complete line of **indicating, recording and integrating flow meters** (electrical and mechanical types), made by the Brown Instrument Co., Philadelphia, Pa., has just been brought out by that company.*

Copies of comprehensive book, entitled **"How to Weld 29 Metals,"** covering the procedure, conditions and materials for welding modern alloys, are now being offered by the Westinghouse Electric and Mfg. Co., Pittsburgh, Pa., at 50¢ each.

Dealers of the Ford Motor Co. are now distributing copies of the **Ford Home Almanac and Facts Book for 1937.**

The Geneva Metal Wheel Co., Geneva, Ohio, has issued a new booklet which gives complete data on its line of **wheels** ranging from 9 to 84 in. in diameter with capacities of 1 lb. to 12,000 lb. per wheel.*

The new publication, called the **"Copper Alloy Bulletin,"** is now being published by the Bridgeport Co., Bridgeport, Conn.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Strikes Cut Output

(*Continued from page* 413)

advance already made in February, it is expected that the current month's sales volume will be limited only by the ability to supply new vehicles.

The Studebaker Corp. reports the sale of 7971 passenger cars and trucks in February compared with 6196 in February, 1936—a gain of 28 per cent. Gain for January was also 28 per cent. For the year to date, 15,704 units have been sold compared with 12,232 last year.

Domestic retail deliveries of Buick motor cars during the last 10 days of February totaled 1844 units, bringing total deliveries for the month to 5153. This compares with 2890 deliveries in the final 10-day period of February a year ago and 6577 for the month of February, 1936.

Despite a month's suspension of production and a consequent shortage in dealer stocks, Cadillac-LaSalle retail deliveries in February were 20 per cent greater than a year ago. February's sales totaled 1650 cars and last year February sales were 1380. Production at the factory has now been restored to normal. Unfilled dealer orders on hand are reported above the 10,000 mark.

February sales and production figures just released by Pontiac Motors show that business suffered only moderately because of the strike in effect most of the month. Retail deliveries declined to 8232 for the month from 8519 for February last year. Shortage of some of the popular body styles in dealers' stocks was the cause. Unfilled orders increased during the same period. The number of cars manufactured during the month was 8036, compared with 8814 in February last year. For the first two months of the year retail sales totaled 21,835, against 16,772 for the similar period last year. With production scheduled at 30,000 cars for March, dealers' stocks are rapidly being replenished and Pontiac executives predict that 28,000 new cars will be sold at retail during the month.

71 New Studebaker Dealers

Seventy-one Studebaker dealers were appointed during the month of February, according to George D. Keller, vice-president in charge of sales of the Studebaker Corp.

Letters

to AUTOMOTIVE INDUSTRIES

Preloaded Ball Bearings

I have seen printed reference inferring that preloading of ball bearings on machine tools originated only six years ago. Indications are that the first successful quantity production preloaded spindles were made about 1913.

The actual preloading was first used in 1909 by F. W. Gurney at this plant.

It is also interesting that the angular-contact-type bearing was originated by F. W. Gurney and this is the one which lends itself so readily to preloading, and that this bearing was made for ten years by the Gurney Company alone before anyone else attempted to use it.

THOMAS BARISH,
Assistant Chief Engineer,
Marlin-Rockwell Corp.

Braking Efficiency

It seems to me that braking efficiency can have a definite expression, based on rational considerations, not on some convention. If we consider the distance in which a vehicle actually stops, and the shortest distance in which it can be stopped, the "braking efficiency" is nothing else than the quotient of these two values.

The shortest distance in which a vehicle can be stopped, is defined by the relation:

$$\mu Q s = \frac{1}{2} \cdot \frac{Q}{g} v^2$$

in which μ is the coefficient of friction between the tire and the road surface,

Q, the total weight of the vehicle

s, the shortest distance in which it stops

g, acceleration of gravity

v, velocity at the instant the brakes begin to act.

The first term of the above relation represents the work done by the maximum braking force, while the second represents the kinetic energy to be destroyed.

From the above relation, it results:

$$s = \frac{v^2}{2\mu g}$$

and depends only upon the velocity of the vehicle and the friction coefficient between tire and road. Dividing by s_1 — the actual distance in which the vehicle stops, on a road surface of known μ (proving ground) — the braking efficiency result is

$$\eta = \frac{v^2}{2\mu g s_1}$$

and it will be seen that generally it is not constant over the entire speed range of the vehicle.

SAMUEL REIS,
Milan, Italy.

Just Among Ourselves

John Doe's Whiskers Fall

BY naming John L. Lewis in its petition for an injunction which would compel sitting-down strikers to evacuate its occupied plants, the Chrysler Corp. has brought him one step nearer to the public accounting which he must inevitably make.

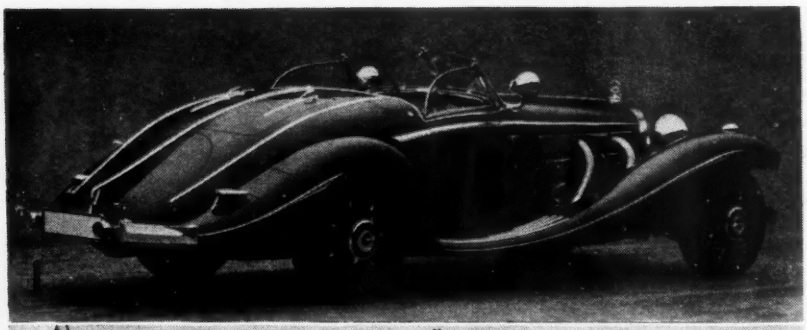
In the injunction petition, Messrs. Lewis, Martin and Frankensteen are charged with conspiracy to seize the property and harm the business of the corporation. Mr. Lewis, of course, will be privileged like any other citizen to answer the charges through the voice of his counsel, but some kind of an answer will have to be made. It will be interesting to see in what terms an incontrovertible fact is defended.

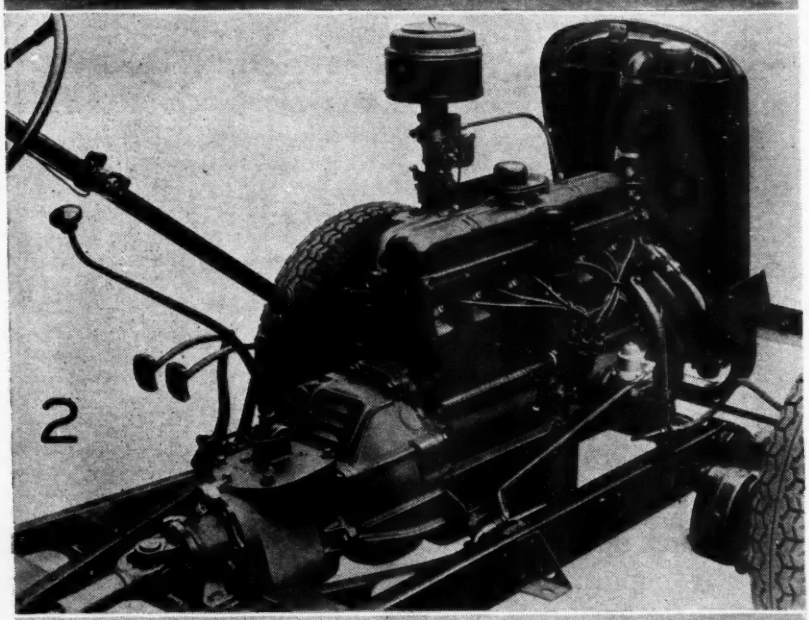
The events leading up to the General Motors settlement weaken our hope that the present strikes will produce anything concrete in defining the status of sitdown strikes and strikers. But something is accomplished by aggressively shifting the responsibility for the strike, as Chrysler has done, from John Doe to John Lewis.

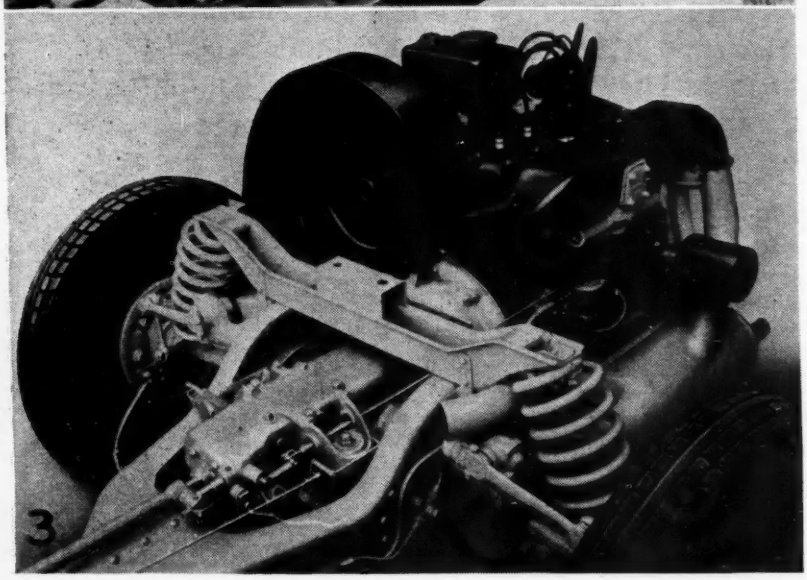
The record shows that on one or two occasions when Mr. Lewis has been directly connected with damage-causing strikes, he has not been able to avoid the consequences of his acts. So the mere act of removing John Doe's whiskers may have some rather important consequences.—H. H.

Berlin Automobile Show

By Edwin P. A. Heinze







THE display of new models at the annual automobile show which closed in Berlin on March 7, seems to show that the German passenger-car industry is in a quandary as to further development. It is quite evident from registration figures that the German public prefers the light car; no less than 80.3 per cent of all cars registered on July 1, 1936, had a displacement not exceeding 122 cu. in., and there seems therefore to be little inducement to foster the manufacture of cars with larger engines. On the other hand, there are now 780 miles of the new super highways open to the public, and they have attracted a large amount of traffic, so that it is obvious that these new roads with their double traffic lanes of more than 20 ft. width each will be a factor the automotive industry will have to consider.

There are no trees bordering these roads, no hedges and no houses, and there is no oncoming traffic on the same section, so motorists upon entering these highways usually open the throttle wide and drive their cars to the limit, with the result that the small engines are often over-strained. What is needed for such service is cars with relatively large engines, turning over at moderate speeds and having exceptionally good stamina. Although cars are no longer subjected to a direct annual tax in Germany, there is a heavy tax on motor fuel, and the need for economy is against the use of large engines. What the German industry seems to be attempting at present is to produce slightly larger cars with higher top speeds

1—Mercedes-Benz sports car with new eight-in-line, 329-cu. in., supercharged, 180-hp. engine

2—Powerplant of the new Opel 153-cu. in. model including an overhead-valve engine

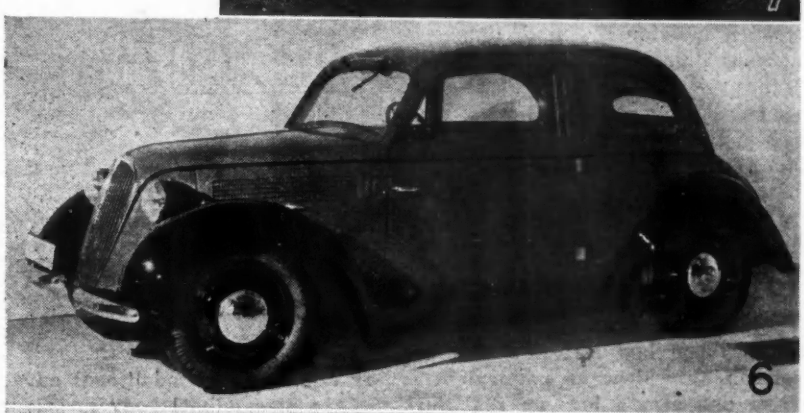
3—Powerplant arrangement of Mercedes-Benz rear-engined car

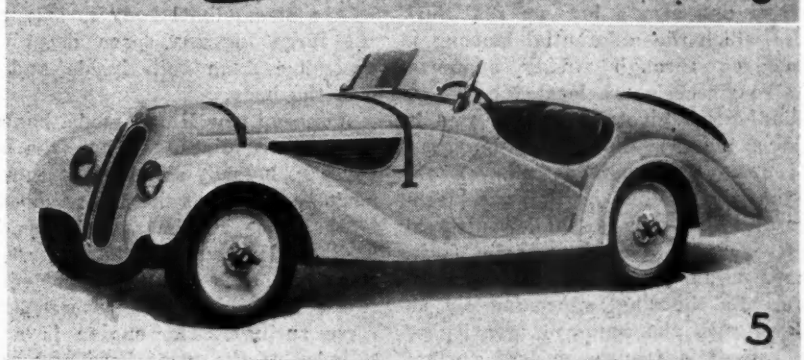
Marks New German Trend

High fuel cost and super highways influence design of latest models. More power with low operating cost the main objective in all new lines.

but as economical as possible with respect to fuel consumption.

The Adam Opel Company (G.M. subsidiary) has tried to solve the problem with two new models. It has taken its very successful six-cylinder model and substituted a valve-in-head engine of 153 cu. in. displacement for the L-head engine of 122 cu. in. This is the first time Opel has ever built valve-in-head engines. The engine, moreover, is of a decided short-stroke type, the cylinder dimensions being 3.15 by 3.23 in. Pistons are of light alloy and the compression ratio is 6 to 1. The output is 55 hp. at 3600 r.p.m. The Carter carburetor, manufactured by Opel, is continued, and automatic heat control is a feature of the induction system. Ignition is by the Bosch battery system and spark advance is automatic (by centrifugal weights). The powerplant has a five-point support on the frame through the intermediary of rubber blocks. A return has been made to the three-speed transmission, which latter has all helical gears and synchronized shift between second and third speeds. The propeller shaft has two metal uni-





4—New Wanderer car with four-cylinder 42-hp. engine

5—B.M.W. sports car with six-cylinder 80-hp. engine

6—D.K.W. car with two-stroke V-4, 32-hp. engine

7—Front end of Hansa streamlined car

versal joints with needle bearings, and the drive is of the Hotchkiss type. Front wheels are independently suspended by the Dubonnet system. The pressed-steel, spoked wheels have cast-iron brake drums and carry 16-5.50-in. tires. The foot brake is hydraulic and operates on all four wheels. There is an inverted brake lever on the instrument board which actuates the rear-wheel brakes by direct mechanical connection. This car has a wheelbase of 104 in. and a tread of 49.5 in.

The second new Opel model is similar in lay-out to the one described but has a 220-cu. in. engine with a bore of 3.54 and a stroke of 3.74 in. It is equipped with iron pistons and uses a compression ratio of 6.15 to 1, its rating being 75 hp. at 3600 r.p.m. Spark advance is controlled by the inlet vacuum. The same three-speed transmission is employed as with the smaller engine. The final drive ratio is 4.5. Tires of 6.5-in. width are carried on the spoked steel wheels of 16 in. rim diameter.

These new models have more elaborately-furnished interiors than former Opel cars. Front seats can be adjusted individually, and the large instrument dials are arranged in front of the steering wheel, which latter now has spring spokes. A wood-grain finish is used for the instrument board. Aside from the new curves of the front end, the cars do not differ much in appearance from the models which they supersede.

What was heralded as the first fully-streamlined car is a new Hansa with backbone chassis of large box section. The backbone has a forked forward extension on which the powerplant is carried and also a bent-up rear fork from which the differential housing is suspended through rubber supports. The rear wheels are located by longitudinal arms pivoted to the frame in such a manner that in swinging up and down their ends describe an arc of the same radius as the wheel centers, so that only a single universal joint is needed for each axle shaft. Fitted on top of the frame above the differential housing, approximately on a level with the center of gravity of the car, is a transverse leaf spring, the ends of which are connected to the wheel spindles by shackles. Double-acting hydraulic shock absorbers are also fitted. The steering heads of the front wheels are held between the ends of the shock-absorber arms and a transverse spring below them. This car is fitted with a four-cylinder, 92-cu. in engine of 2.95-in. bore and 3.35-in. stroke, with a compression ratio of 6 to 1. The engine, which is equipped with two Solex carburetors, is rated 40 hp. at 3500 r.p.m. The car has a four-speed transmission and a final drive ratio of 4.1 to 1. Its weight is 3300 lb. Tire equipment is 5.25 in. tires on 16-in. rims. It is claimed that owing to the excellent streamlining the car is capable of a top speed of 85 m.p.h. The wheelbase is 110 in. and the tread 52.7 in. The windshield is divided into four sections and has a very decided rearward slope. An unusual feature is the arrangement of the instrument board, which is in the form of a desk with rectangular slots in it through which the dials can be read. In addition to the instruments usually found on passenger cars, they comprise also a revolution counter. This car is being offered in Germany at 3850 marks ($1,550) which is identical with the price of the smaller of the two new Opels. While the weight of the car is relatively high, the streamlining is said to result in unusual fuel economy, the car being able to do 20 miles to the U. S. gallon at a steady speed of 71 m.p.h. An additional advantage of the streamlined body is said to be the large luggage space it provides, accessible from both inside and outside the body.

A second new Hansa model has more conservative lines. It has the same chassis layout as the streamlined model, except that the front suspension is the same as that which has been used on Hansa cars in the past, the steering heads being supported between the ends of superposed transverse springs. The engine is a six-cylinder of the same bore and stroke as the four-cylinder of the streamlined model and has 122 cu. in. displacement, its rating being 50 hp. at 3600 r.p.m. The wheelbase is 112½ in. while the track is the same as that of the streamlined model. This model with its larger engine sells at the same price as the streamlined model.

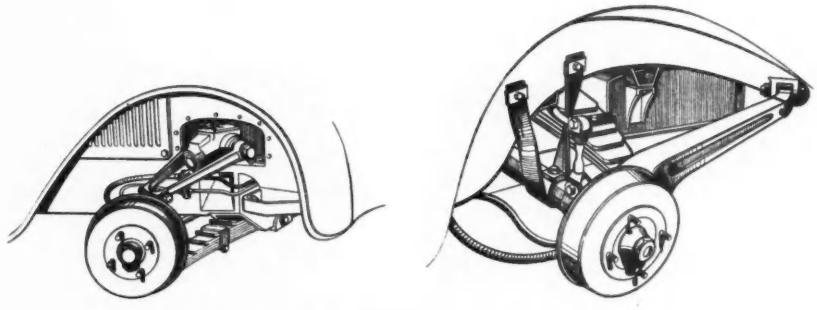
The sides of the engine compartment are fixed in place and the fenders merge into them. Headlamps are built into the fronts of the fenders. The cover of the engine compartment is in two sections, right and left; in the driver's compartment there are two knobs, and when one of these is pulled back by the driver the section on the particular side snaps open.

A third Hansa model, first shown a year ago, is now to be put in production. It has a wheelbase of 122 in., a track of 52.7 in., and a 214-cu. in. six-cylinder engine. This engine is rated 90 hp. at 3500 r.p.m., and the car is said to have a maximum speed of 85 m.p.h.

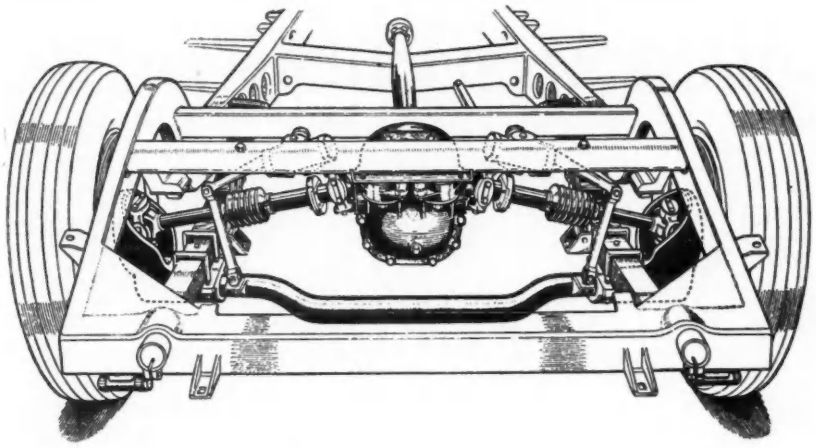
All Hansa cars have hydraulic four-wheel brakes with cast drums, and a central chassis lubrication system, which serves mainly for the front-wheel assembly, as all joints at the rear end are of the rubber-bushed type.

Mercedes-Benz this year offer several models with aluminum high-compression cylinder heads as standard equipment, and others in which these heads are optional. In most cases the engines equipped with these high-compression heads call for the use of special benzol-blend fuels, which are obtainable at all filling stations at about 10 per cent above the price of standard motor fuels. The two 104-cu. in. models introduced last year, one with front-mounted engine and X-shaped tubular frame, the other with a backbone-type frame and rear-mounted engine, have remained practically the same; but the six-cylinder 122-cu. in. model of last year is now being supplied with an L-head engine of 140-cu. in. displacement, developing 55 hp. Aluminum cylinder heads are furnished. Independent springing all around, with coil springs at the rear, is retained. This 140-cu. in. car is supplied in two lengths of wheelbase and is said to have a top speed of 68-71 m.p.h. Its engine has a bore and a stroke of 2.85 by 3.53 in. In this new model Mercedes-Benz has adopted the downdraft carburetor for the first time. The Solex dual carburetor, with acceleration pump, starting unit and economizer, is fitted.

About two years ago Mercedes-Benz



Front and rear independent suspensions of the new Adler



Horch rear axle with rigid tubular carrying member and spring-suspended final-drive housing

discontinued the only model in the 3-4-liter (183-244-cu. in.) range which was then manufactured by them. Now a new model with a six-cylinder 195-cu. in. engine has been introduced. It has been developed from the 177-cu. in. model, having a chassis identical with that of the latter, with independent springing at both front and rear. The new L-head engine has a bore of 3.25 and a stroke of 3.94 in. An aluminum head is employed and the compression ratio is 5.56. The rating is 78 hp. at 4000 r.p.m. A seven-bearing crankshaft is used. Disk wheels with 17 by 6.50-in. tires are standard equipment. The rear-axle ratio is 4.33. It is noteworthy in this connection that Mercedes-Benz has discontinued the overdrive, which has been featured by it for a number of years past. The new model is said to have a top speed of 79 m.p.h.

Next in order in the Mercedes line come two straight eights, one with an L-head engine of 305 cu. in. displacement, the other with a supercharged valve-in-head engine. The latter formerly also had a displacement of 305 cu. in., but this has now been increased to 329 cu. in. and the output has been raised 20 hp. in consequence. The maximum output of this engine is now 115 hp. without, and 180 hp. with the supercharger. Suspension on coil springs is employed at the forward end.

The Auto-Union combine has made a radical change in its Wanderer line, evidently to enable it to cut into the market which Mercedes-Benz has developed for its 104-cu. in. models. It has brought out two new models, with four- and six-cylinder engines respectively. The company, moreover, has switched from valve-in-head to L-head engines, which is rather contrary to the general German trend. The four-cylinder 2.95 by 3.94-in. engine of 110-cu. in. displacement and with a compression ratio of 6.4 is rated 42 hp. at 3600 r.p.m. A three-speed transmission is fitted and the final drive is through a tubular propeller shaft with two metal universal joints. A standard banjo-type rear axle has replaced the independently-sprung swinging-type of former models. Rear suspension is by a single cross spring secured at its center to a frame cross member and resting with its ends on "turrets" welded to the axle housings near the wheels. This method of suspension, which has been used for years on the DKW cars of the corporation and last year was used also on the larger Wanderer, has the advantage that it brings the axis of suspension into the plane of the center of gravity and thus prevents swaying on turns. Front suspension is independent, the steering heads being supported by the wishbone-type arms of the shock absorbers on top and the ends of a transverse leaf spring at the bottom. This car is equipped with the Ross cam-and-lever steering gear which is being manufactured in Germany by the Zahnradfabrik Friedrichshafen and is coming into use rapidly. All chassis points requiring lubrication are connected up to a central chassis lubrication system. Tire equipment is 17-5.00 in. The car has a wheelbase of only 102 in. and with a two-door sedan body weighs 2420 lb. The design of the six-cylinder model is practically identical. It has a wheelbase of 114 in., its engine is rated 62 hp., and it is more lavishly equipped. While the smaller car has a top speed of 62 m.p.h., that of the larger one is 72 m.p.h.

While the small two-stroke, two-cylinder DKW front-wheel drive models are continued practically unchanged, the larger four-cylinder two-stroke model has been replaced by an entirely new design having much in common with the Wanderer cars just described. The V-4, 62-cu. in. engine is retained with few changes, but its bearings have been improved, each bank of two cylinders has its own Solex carburetor, and cooling is by thermo-siphon circulation. It is equipped with a four-speed gearbox and a free-wheeling unit, this being the only German make which still carries such a unit. It is said to be retained here because it facilitates gear shifting and

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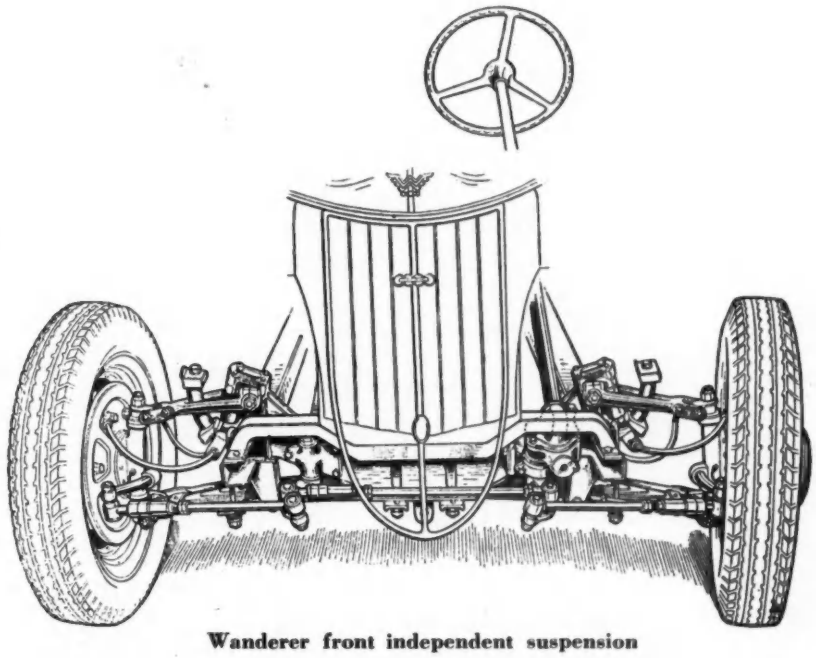

Wanderer front independent suspension

MECHANICAL SPECIFICATIONS OF C

MAKE AND MODEL	ENGINE: Number of Cylinders Bore and Stroke (Ins.)	ENGINE: Maximum Brake HP at Specified R.P.M.	ENGINE: Piston Displacement (Cu. Ins.)	ENGINE: Compression Ratio (To—1)	ENGINE: Cylinder Arrangement	ENGINE: No. of Main Bearings	ENGINE: Valve Location	ENGINE: Crankcase Type	ENGINE: Piston Material	ENGINE: Camshaft Drive	GENERAL: Wheelbase (Ins.)	GENERAL: Tread—Rear (Ins.)	GENERAL: Tires (Ins. or Metric)	GENERAL: Oil pressure to—	Fuel System: No. Used and Type of Carburetor	Fuel System: Supercharged	Clutch Type	Transmission: Location	Transmission: Type	Transmission: No. of Forward Speeds	Transmission: Synchronizing Clutches	Rear Axle: Final Drive	Rear Axle: Gear Ratio—to 1	Rear Axle: Torque taken by	Drive on	Independent Suspension	Brakes: Service	Brakes: Servo Unit Fitted	Chassis Weight (Lbs.)
BELGIAN																													
Imperia T.A. 9	4-2.93x3.74	40-3500	100.6	5.80	I	4	L	In	Al	C	111.2	49.2	4.75/17	abe	..Up	N	SP	U	Hs	4	Y	Wo	4.87*	sp	F	A	M	N	1631
Imperia T.A. 7	4-2.56x2.95	25-3500	61.0	5.60	I	4	L	In	Al	C	102.4	47.2	4.50/17	abe	..Up	N	SP	U	Hs	4	Y	Wo	5.43*	sp	F	A	M	N	1279
Minerva V-8	8-3.15x3.54	93-3600	219.6	6.50	V	3	L	Se	Al	H	120.1	58.3	6.00/18	abce	..Do	N	N	U	Au	(1)	..	(2)	D*	...	F	A	H	Y	2094
CZECHOSLOVAKIAN																													
Praga B	4-2.38x3.46	20-3000	80.8	5.85	I	2	L	Se	Al	H	100.0	46.1	5.75/16	abce	..Up	N	SP	U	Hs	3	Y	SB	5.55	ta	R	A	M	N	1367
Praga Lady	4-2.95x3.70	33-3000	101.2	6.00	I	3	L	Se	Als	H	104.3	49.6	5.75/16	abce	..Up	N	SP	U	Hs	3	Y	SB	5.12	ep	R	F	M	N	1764
Praga LN	4-2.75x3.70	28-3000	88.4	5.73	I	3	L	Se	Als	H	118.1	52.0	6.50/18	abce	..Up	N	SP	U	Hs	3	N	SB	...	ep	R	N	M	N	2022
Praga Golden	6-3.35x4.53	76-3000	238.6	5.60	I	4	L	Se	Als	C	137.8	55.5	6.50/16	abce	..Do	N	SP	U	Hs	3	Y	Hy	4.55	ep	R	F	H	N	3197
Skoda Popular	4-2.56x2.95	22-3500	60.7	6.00	I	2	L	In	Als	C	95.7	43.3	5.25/16	abce	..Ho	N	SP	S	Hs	3	Y	SB	5.70	ta	R	A	M	N	992
Skoda Popular Monte-Carlo	4-2.76x3.54	31-3500	84.2	5.90	I	3	L	In	Als	C	98.8	47.2	140/40	abce	..Do	N	SP	S	Hs	3	Y	SB	4.80	ta	R	A	M	N	1168
Skoda Rapid	4-2.76x3.54	31-3500	84.2	5.90	I	3	L	In	Als	C	100.4	48.0	5.75/16	abce	..Ho	N	SP	U	Hs	3	Y	SB	5.50	ta	R	A	M	N	1433
Skoda Favorit	4-2.95x4.02	38-3500	109.8	5.90	I	6	L	In	Als	C	120.1	51.9	6.00/16	abce	1-Do	N	SP	U	Hs	4	Y	SB	5.50	ta	R	A	M	N	1675
Skoda Superb	6-2.95x4.33	66-3500	178.1	5.90	I	8	L	In	Als	C	129.9	53.5	6.50/16	abce	1-Up	N	SP	U	Hs	4	Y	SB	4.90	ta	R	A	M	N	2205
Zbrojovka Z6	2-2.83x3.54	19-3000	44.8	5.00	I	3	N	In	Al	N	94.5	41.3	118/655	None	..Up	N	SP	U	Hs	3	N	Wo	5.33*	ep	F	A	M	N	882
Zbrojovka Z4	2-3.21x3.70	25-3000	59.8	5.00	I	3	N	In	Al	N	108.7	43.3	130/683	None	..Up	N	SP	U	Hs	3	N	SB	5.23*	ep	F	A	M	N	1202
Zbrojovka Z5	4-2.83x3.54	40-3200	89.7	5.00	I	5	N	In	Al	N	113.2	46.9	140/702	None	..Up	N	SP	U	Hs	3	N	SB	4.88*	ep	F	A	H	N	1587
FRENCH																													
Berliet 9 hp Dauphine	4-2.68x4.41	35-3800	97.6	5.60	I	2	I	In	Al	C	117.4	53.2	150/40	abce	..Do	N	SP	U	Hs	4	Y	SB	5.30	ep	R	F	M	N	1323
Berliet 11 hp Dauphine	4-3.15x3.94	50-4000	122.1	5.80	I	3	I	In	Al	C	121.5	53.2	150/40	abce	..Do	N	SP	U	Hs	4	Y	SB	4.90	ep	R	F	...	...	1543
Bugatti 57	8-2.83x3.94	140-4800	201.4	6.00	I	6	I	Se	Al	H	129.9	53.2	5.50/18	abce	1-..	N	SP	U	Hs	4	N	SB	4.20	ta	R	N	M	N	2094
Chenard & Walcker T22M	4-3.13x4.33	61-3600	132.9	6.20	I	3	I	Se	Al	H	119.1	55.9	15/65	abce	..Do	N	SP	U	Hs	4	N	SB	4.60	ep	R	F	M	N	3086
Chenard & Walcker V14C	8-3.13x3.54	90-4000	217.2	6.00	V	3	L	In	Al	C	128.9	55.9	16.5/66.4	abce	..Do	N	SP	U	E	4	N	SB	4.10	ep	R	F	H	N	3527
Citroen 7	4-2.83x3.94	35-3200	99.3	5.90	I	3	I	Se	Al	C	114.6	52.7	140/40	c	..Do	N	SP	U	Hs	3	Y	SB	3.87*	tt	F	A	H	N	2205
Citroen 11	4-3.07x3.94	42-3200	116.6	5.90	V	3	I	Se	Al	C	129.5	57.1	150/40	c	..Do	N	SP	U	Hs	3	Y	SB	3.87*	tt	F	A	H	N	2601
Delage D1.12	4-3.15x4.21	50-3200	131.2	6.37	I	3	I	In	Al	C	116.1	45.6	5.50/17	abcde	2-Do	N	SP	U	Hs	4	N	SB	4.60	ep	R	F	H	N	1786
Delage D6.60	6-3.03x3.56	65-3600	154.2	6.47	I	4	I	In	Al	C	124.0	57.4	5.50/17	abcde	2-Do	N	SP	U	Hs	4	N	SB	4.60	ep	R	F	H	N	1896
Delage D6.70	6-3.15x3.56	77-3800	166.5	6.90	I	4	I	In	Al	C	129.9	57.4	6.00/17	abcde	2-Do	N	SP	U	Hs	4	N	SB	4.60	ep	R	F	H	N	2116
Delage D6.80	6-3.15x4.21	87-3200	204.3	6.25	I	4	I	In	Al	C	131.9	58.7	6.50/17	abcde	2-Do	N	SP	U	E	4	N	SB	4.30	ep	R	F	H	Y	2414
Delage D8.100	8-3.15x4.21	114-3600	262.3	6.37	I	5	I	In	Al	C	142.9	59.0	7.00/17	abcde	2-Do	Y	SP	U	E	4	N	SB	4.30	ep	R	F	H	Y	2866
Delage D8.120	8-3.15x4.21	142-4000	262.3	7.25	I	5	I	In	Al	C	131.9	59.0	7.00/17	abcde	2-Do	Y	SP	U	E	4	N	SB	3.90	ep	R	F	H	Y	2756
Hispano Suiza K-G Normal	6-3.94x4.33	120-3200	298.9	5.00	I	7	I	Se	Al	H	134.6	57.1	16/45	abcde	..Up	..	MD	U	...	3	N	SB	3.64	tt	..	N	M	Y	2846
Hispano Suiza K-G Long	6-3.94x4.33	120-3200	298.9	5.00	I	7	I	Se	Al	H	146.5	57.1	16/45	abcde	..Up	..	MD	U	...	3	N	SB	3.40	tt	..	N	M	Y	2756
Hispano Suiza T.12-Sport	12-3.94x3.94	200-3000	574.6	5.00	V	7	I	In	Al	H	134.6	57.1	17/45	abcd	..Do	..	MD	U	...	3	N	SB	2.72	tt	..	N	M	Y	3086
Hispano Suiza T.12-Light	12-3.94x3.94	200-3000	574.6	5.00	V	7	I	In	Al	H	146.1	57.1	17/45	abcde	..Do	..	MD	U	...	3	N	SB	2.88	tt	..	N	M	Y	3108
Hispano Suiza T.12-Normal	12-3.94x3.94	200-3000	574.6	5.00	V	7	I	In	Al	H	150.0	59.1	17/50	abcde	..Do	..	MD	U	...	3	N	SB	3.40	tt	..	N	M	Y	3461
Hispano Suiza T.12-Long	12-3.94x3.94	200-3000	574.6	5.00	V	7	I	In	Al	H	157.8	59.1	17/50	abcde	..Do	..	MD	U	...	3	N	SB	3.64	tt	..	N	M	Y	3483
Hotchkiss 480	4-3.15x3.92	55-3800	122.0	5.90	I	3	I	In	Als	C	115.2	56.3	6.00/16	abce	..Do	N	SP	U	Hs	4	Y	SB	4.60	ep	R	N	M	N	1907
Hotchkiss 486	4-3.38x3.92	65-3800	140.9	5.90	I	3	I	In	Als	C	115.2	56.3	6.00/16	abce	..Do	N	SP	U	Hs	4	Y	SB	4.45	ep	R	N	M	N	1907
Hotchkiss 686 G.S.	6-3.15x3.94	125-4000	184.0	7.00	I	7	I	In	Als	C	110.2	56.3	6.00/16	abce	..Do	N	SP	U	Hs	4	Y	SB	3.33	ep	R	N	M	N	2061
Hotchkiss 680	6-3.15x3.94	85-3800	184.0	5.90	I	7	I	In	Als	C	121.7°	56.3°	6.00/16°	abce	..Do	N	SP	U	Hs	4	Y	SB	4.18°	ep	R	N	M	N	2061
Hotchkiss 686	6-3.38x3.94	100-3800	208.5	5.90	I	7	I	In	Als	C	121.7°	57.1°	6.00/16	abce	..Do	N	SP	U	Hs	4	Y	SB	3.82°	ep	R	N	M	N	2063
Hotchkiss 686 P.N.	6-3.38x3.94	125-4000	208.5	7.00	I	7	I	In	Als	C	121.7°	56.3°	6.00/16	abce	..Do	N	SP	U	Hs	4	Y	SB	3.63°	ep	R	N	M	N	2105
Licorne L	4-2.64x3.15	24-3500	68.6	6.00	I	2	L	In	Als	H	102.1	52.8	130/40	abc	1-Ho	N	SP	U	Hs	4	N	SB	5.85	tt	R	F	M	N	1543
Licorne LR	4-2.99x3.15	36-3500	88.5	6.20	I	2	L	In	Als	H	114.2	52.8	140/40	abc	1-Ho	N	SP	U	Hs	4	N	SB	5.22°	tt	R	F	M	N	1653
Licorne I35	4-3.15x3.93	.....	122.0	6.80	I	3	I	In	Als	C	119.0	52.8	160/40	abc	1-Ho	N	SP	U	Hs	4	N	SB	4.56	tt	R	F	M	N	1874
Licorne M35	4-3.31x4.33	80-3500	146.4	6.80	I	3	I	In	Als	C	119.0	52.8	160/40	abc	1-Ho	N	SP	U	Hs	4	N	SB	4.22	tt	R	F	M	N	1984
Licorne M35	4-3.31x4.33	80-3500	146.4	6.80	I	3	I	In	Als	C	120.8	57.5	160/40	abc	1-Ho	N	SP	U	Hs	4	N	SB	4.56	tt	R	F	M	N	2205
Matford 72	8-2.62x3.20	65-4000	135.8	6.30	V	3	L	In	St	H	108.3	59.4	150/40	abc	..Dd	N	SP	U	Hs	3	Y	SB	4.55	tt	R	N	M	N	1543
Matford 76	8-3.06x3.75	90-3800	221.0	6.30	V	3	L	In	Al	H	112.0	58.2	6.00/16	abc	..Dd	..	SP	U	...	3	Y	SB	4.11	tt	..	N	M	N	1830
Peugeot 201M	4-2.83x3.54	35-4000	89.4	5.80	I	3	L	In	Al	C	102.0	48.8	140/40	ace	.....	..	SP	U	Hs	3	Y	Wo	5.50	tt	R	F	M	N	1146
Peugeot 302	4-3.07x3.62	43-4000	109.4	6.00	I	3	I	In	Al	C	113.4	50.5	140/40	ace	..Do	N	SP	U	Hs	3	Y	Wo	5.00	tt	R	F	M	..	1246
Peugeot 402	4-3.27x3.62	56-4250	121.4	6.00	I	3	I	In	Al	C	124.0	53.2	150/40	ace	..Do	N	SP	U	Hs	3	Y	Wo	5.00	tt	R	F	M	..	1301
Renault Celtraquatre	4-2.76x3.74	.....	99.2	5.50	I	2	L	In	Als	H	106.7	51.2	5.25/16	abc	1-Do	N	SP	U	Hs	3	Y	SB	4.57	tt	R	N	M	..	.....
Renault Primaquatre	4-3.35x4.13	.....	145.4	6.00	I	3	L	In	Als	H	112.6	51.2	5.50/16	abc	1-Do	N	SP	U	Hs	3	Y	SB	3.77	tt	R	N	M	N	.....
Renault Vivaquatre	4-3.35x4.13	.....	145.4	6.00	I	3	L	In	Als	H	118.5	57.2	6.25/16	abc	1-Do	N	SP	U	Hs	3	Y	SB	4.11	tt	R	N	M	N	.....
Renault Viva gram Sport	6-3.35x4.72	.....	249.2	6.00	I	4	L	In	Als	H	81.1	57.2	6.25/16	abc	1-Do	N	SP	U	Hs	3	Y	SB	3.73	tt	R	N	M	N	.....
Renault Vivastella	6-3.35x4.72	.....	249.2	6.00	I	4	L	In	Als	H	123.2	57.2	6.50/17	abc	1-Do	N	SP	U	Hs	3	Y	SB	4.30	tt	R	N	M	Y	.....
Renault Nerva gram Sport	8-3.35x4.72	.....	332.3	6.00	I	5	L	In	Als	H	126.4	57.2	15/45	abc	1-Dd	N	SP	U	Hs	3	Y	SB	3.73	tt	R	N	M	Y	.....
Renault Nervastella	8-3.35x4.72	.....	332.3	6.00	I	5	L	In	Als	H	133.1	57.2	15/45	abc	1-Dd	N	SP	U	Hs	3	Y	SB	3.73	tt	R	N	M	Y	.....
Talbot Baby Jr. T11	6-2.76x3.40	55-4000	121.8	6.00	I	4	I	In	Al	C	116.1	57.7	150/40	abc	..Do	N	SP	U	Hs	4	Y	SB	5.10	ep	R	F	M	..	1653
Talbot Cadette T11 Long	6-2.76x3.40	55-4000	121.8	6.00	I	4	I	In	Al	C	126.0	57.7	160/40	abc	..Do	N	SP	U	Hs	4	Y	SB	5.10	ep	R	F	M	..	1698
Talbot Cadette T15	6-2.91x4.11	75-3800	164.5	6.30	I	4	I	In	Al	C	126.0	57.7	160/40	abc	..Do	N	SP	S	Ps	4	Y	SB	4.70	ep	R	F	M	..	2116
Talbot Baby Major T17	6-3.07x4.11	90-3800	182.8	6.30	I	4	I	In	Al	C	126.0	57.7	160/40	abc	..Do	N	SP	S	Ps	4	Y	SB	4.30	ep	R	F	M	..	2161
Talbot Baby Sport 17 hp	6-3.07x4.11	90-3800	182.8	6.30	I	4	I	In	Al	C	116.1	57.7	5.25/18	abc	..Do	N	SP	S	Ps	4	Y	SB	4.30	ep	R	F	M	..	2116
Talbot T120 Long	6-3.07x4.11	90-3800	182.8	6.30	I	4	I	In	Al	C	135.8	57.7	6.50/17	abc	..Do	N	SP	S	Ps	4	Y	SB	5.10	ep	R	F	M	..	2315
Talbot Baby 4 Litres T23	6-3.54x4.11	140-4000	243.8	6.30	I	7	I	In	Al	C	116.1	57.7	5.50/18	abc	..Do	N	SP	S	Ps	4	Y	SB	3.92	ep	R	F	M	..	2116
Unic U. 4	4-2.87x4.72	50-3800	122.0	5.50	I	3	L	...	Als	...	127.2	57.1	160/40	abc	2-Ho	N	SP	..	E	4	..	Hy	4.60	ep	R	F	M	..	2160
Unic U. 6 Sport	6-2.95x4.44	82-3300	183.0	6.00	I	4	L	...	Als	...	130.9	57.1	180/40	abc	2-Ho	N	SP	..	E	4	..	Hy	4.20	ep	R	F	M	..	2227
Voisin C28	6-3.15x4.33	90-3500	201.3	6.00	I	3	D	Se	Al	C	129.1	53.2	6.50/18	ace	2-Ho	N	Do	U	E	4	..	SB	3.92	tt	R	N	H	N	2756
Voisin V12L	12-2.99x4.33	150-3500	366.0	6.00	I	5	D	Se	Al	C	124.0	53.2	6.50/18	ace	4-Ho	N	MD	U	E	4	..	SB	3.35	tt	R	N	H	N	4079
GERMAN																													
Adler 1E	4-2.56x2.96	25-4000	60.7	6.00	I	3	L	In	Als	C	103.5	47.7	4.50/17	abce	..Up	N	SP	U	Hs	4	Y	SB	5.43*	ep	F	A	M	N	1250
Adler 1.7E	4-2.92x3.74	38-3800	100.2	5.80	I	3	L	In	Als	C	108.3	49.2	5.00/17	abce	..Up	N	SP	U	Hs	4	N	SB	4.78	ep	F	A	H	N	3461
Adler 1.7EV	4-2.92x3.74	38-3800	100.2	5.80	I	3	L	In	Als	C	115.0	51.3	5.00/17	abce	..Up	N	SP	U	Hs	4	N	SB	4.87*	ep	F	A	M	N	3549
Adler 3Y	6-2.96x4.34	65-3800	178.0	6.25	I	4	L	In	Als	C	126.0°	56.0	6.00/18	abce	..Do	N	SP	U	Hs	4	Y	SB	4.46	sp	R	F	H	N	2400°
B.M.W. 319w. 329	6-2.56x3.78	45-3750	116.5	5.60	I	4	I	In	Al	C	94.5	50.0	5.25/16	abcde	2-Up	N	SP	U	Hs	4	Y	SB	4.40	sp	R	F	M	N	1510
B.M.W. 328 Sport	6-2.60x3.78	80-4500	120.2	7.50	I	4	I	In	Al	C	94.5	48.0	5.25/16	abcde	3-Do	N	SP	U	Hs	4	Y	SB	3.90	sp	R	F	H	N	1653
B.M.W. 326	6-2.60x3.78	50-3750	120.2	6.00	I	4	I	In	Al	C	109.5	55.1	5.25/17	abcde	2-Up	N	SP	U	Hs	4	Y	SB	4.87	ta	R	F	H	N	1433
Hanomag Record	4-2.80x3.74	36-3600	91.1	5.70	I	3	I	In	Als	C	111.0	49.2	4.75/17°	ace	..Do	N	SP	U	Hs	4	Y	TB	4.55	ep	R	F	B	Y	1654
Hanomag Garant	4-2.48x3.46	23-3500	65.5	6.80	I	3	I	In	Als	S	97.2	49.2	4.50/17°	ac	..Do	N	SP	U	Hs	4	Y	TB	5.90	ep	R	F	B	Y	1213
Hanomag Kurier	4-2.48x3.46	23-3500	65.5	6.80	I	3	I	In	Als	S	107.1	49.2	4.50/17°	ac	..Do	N	SP	U	Hs	4	Y	TB	5.90	ep	R	F	B	Y	1544
Hansa-Lloyd Hansa 1100	4-2.56x3.23	28-3000	66.4	5.80	I	3	I	In	Als	S	106.3	52.0	4.50/17	abce	..Ho	..	SP	U	Hs	4	N	SB	5.28	ta	R	A	H	N	1146
Hansa-Lloyd H3500	6-3.23x4.33	90-3500	212.3	6.00	I	4	I	In	Als	S	122.0	56.7	6.00/17	abce	..Do	..	SP	U	Hs	4	Y	SB	3.80	ta	R	A	H	..	2094
Hansa-Lloyd H2	6-2.76x3.35	50-4000	119.7	6.00	I	4	I	In	Als	S	113.0	52.8	5.00/16	abce	..Do	..	SP	U	Hs	4	Y	SB	4.62	ta	R	A	H	N	1433
Maybach HL	6-3.54x3.94	140-4000	231.3	6.50	I	8	I	In	Al	B	144.9	58.3	6.50/17	abc	..Up	N	MD	U	Ps	4	N	SB	3.60	tt	R	A	M	Y	2978
Maybach DL8	12-3.62x3.94	200-3000	506.6	6.30	V	8	I	In	Al	B	147.0	59.8	7.00/20	abc	..Up	N	MD	S	Ps	4	N	SB	3.58	tt	R	N	M	Y	4409
Mercedes-Benz 170V	4-2.89x3.94	38-3200	103.5	6.00	I	3	L	In	Al	S	112.0	51.6	5.25/16	abcd	..Up	N	SP	U	Hs	4	Y	SB	4.14	tt	R	A	H	N	1433
Mercedes-Benz 170H	4-2.89x3.94	40-3200	103.5	6.00	I	3	L	In	Al	S	102.4	50.0	5.00/17	abcd	..Up	N	SP	U	Hs	4	Y	SB	4.00	tt	R	A	H	N	1433
Mercedes-Benz 230	6-3.64x3.54	55-3500	136.0	6.60	I	4	L	In	Al	S	120.1	54.7	5.50/17	abcd	..Do	N	SP	U	Hs	4	Y	SB	4.70	tt	R	A	H	N	2116
Mercedes-Benz 290	6-3.07x3.94	68-3200	174.9	6.60	I	4	L	In	Al	S	129.9	58.3	6.50/17	abcd	..Up	..	SP	U	Hs	4	Y	SB	4.09	tt	R	A	H	N	2700

CONTINENTAL PASSENGER CARS

MAKE AND MODEL	ENGINE: Number of Cylinders Bore and Stroke (Ins.)	ENGINE: Maximum Brake HP at Specified R.P.M.	ENGINE: Piston Displacement (Cu. Ins.)	ENGINE: Compression Ratio (To—1)	ENGINE: Cylinder Arrangement	ENGINE: No. of Main Bearings	ENGINE: Valve Location	ENGINE: Crankcase Type	ENGINE: Piston Material	ENGINE: Camshaft Drive	GENERAL: Wheelbase (Ins.)	GENERAL: Tread—Rear (Ins.)	GENERAL: Tires (Ins. or Metric)	GENERAL: Oil pressure to—	Fuel System: No. Used and Type of Carburetor	Fuel System: Supercharged	Clutch Type	Transmission: Location	Transmission: Type	Transmission: No. of Forward Speeds	Transmission: Synchronizing Clutches	Rear Axle: Final Drive	Rear Axle: Gear Ratio—to 1	Rear Axle: Torque taken by	Drive on	Independent Suspension	Brakes: Service	Brakes: Servo Unit Fitted	Chassis Weight (Lbs.)
GERMAN—Continued																													
Mercedes-Benz 500	8-3.25x4.53	100-3100	300.0	5.88	I	5	L	In	Al	S	144.5	58.5	6.50/20	abcd	..Up	N	SP	U	Hs	4	Y	SB	5.77	tt	R	N	M	Y	3968
Mercedes-Benz 540K	8-3.46x4.37	115-3400	306.1	5.18	I	5	I	In	Al	S	129.5	59.1	7.00/17	abcd	..Up	Y	SP	U	Hs	4	Y	SB	3.08	tt	R	A	H	Y	3527
Mercedes-Benz..Grosse Merc.	8-3.74x5.32	150-2800	467.0	4.70	I	7	I	In	Al	S	147.6	59.1	7.00/20	abcd	..Up	Y	Dp	U	Hs	4	Y	SB	4.30	tt	R	N	M	Y	4365
Opel P-4	4-2.66x2.95	24-3400	65.1	6.00	I	3	L	In	Al	H	90.0	46.0	4.25/17	abcde	1-Do	N	SP	U	Hs	3	N	SB	5.57	sp	R	N	M	N	1296
Opel Kadett	4-2.66x2.95	24-3400	65.1	6.00	I	3	L	In	Al	H	92.0	46.0	4.50/16	abcde	1-Do	N	SP	U	Hs	3	N	SB	5.57	sp	R	F	H	N	1600
Opel Olympia	4-2.66x3.54	30-3600	78.1	5.90	I	3	L	In	Als	H	93.3	46.0	5.00/16	abcde	1-Do	N	SP	U	Hs	4	N	SB	5.14	sp	R	F	H	N	1830
Opel Admiral	6-3.54x3.74	80-....	220.0	6.25	I	4	I	In	†	H	124.0	57.0	6.50/16	abcde	1-Do	N	SP	U	Hs	3	Y	SB	4.50	sp	R	F	H	N	.....
Opel 2.5 Litre	6-3.15x3.23	59-3600	149.8	6.00	I	4	I	In	†	H	104.0	49.6	5.50/16	abcde	1-Do	N	SP	U	Hs	3	Y	SB	4.30	sp	R	F	H	N	1760
Opel 2.0 Litre	6-2.66x3.54	44-3600	117.2	5 75	I	3	L	In	Als	H	104.0	49.6	5.50/16	abcde	1-Do	N	SP	U	Hs	4	N	SB	4.78	sp	R	F	H	N	1700
Stoewer Grief-Junior	4-2.95x3.31	14-3700	90.6	5.40	O	2	T	Se	Al	C	104.7	49.2	4.75/17	abc	1-Up	N	SP	U	...	4	N	SB	4. 2	ta	..	A	H	N	1257
Stoewer V8	8-2.74x3.23	24-3800	151.0	6.00	V	3	L	In	Al	C	118.1	53.9	5.25/17	abc	..Do	..	SP	U	...	4	N	SB	8.35*	ta	F	A	H	N	1874
ITALIAN																													
Alfa Romeo 6C. 2300B	6-2.76x3.94	76-4400	140.8	7.00	I	7	I	In	Al	C	118.1	57.1	5.50/18	abce	..Up	N	SP	U	Hs	4	Y	SB	4.64	sp	R	A	H	N	2161
Alfa Romeo..6C. 2300B, Long	6-2.76x3.94	76-4400	140.8	6.75	I	7	I	In	Al	C	128.0	57.1	6.00/18	abce	..Up	N	SP	U	Hs	4	Y	SB	5.10	sp	R	A	H	N	2206
Alfa Romeo Pescara	6-2.76x3.94	95-4400	140.8	7.75	I	7	I	In	Al	C	118.1	57.1	5.50/18	abce	..Up	N	SP	U	Hs	4	Y	SB	4.25	sp	R	A	H	N	2161
Alfa Romeo 8C. 2900B	8-2.68x3.94	180-5000	177.2	5.75	I	10	I	Se	Al	S	108.3	53.2	5.50/19	abce	..Up	Y	MD	U	Hs	4	Y	SB	4.55	sp	R	A	H	N	1874
Alfa Romeo..8C. 2900B, Long	8-2.68x3.94	180-5000	177.2	5.75	I	10	I	Se	Al	S	118.1	53.2	5.50/19	abce	..Up	Y	MD	U	Hs	4	Y	SB	5.00	sp	R	A	H	N	1984
Bianchi S. 9/1400	4-2.68x3.94	42-4100	88.6	5.65	I	3	I	In	Al	S	109.6	55.9	6.00/16	abce	..Do	N	SP	U	Hs	4	N	SB	5.10	sp	R	N	H	N	1676
Fiat 500	4-2.05x2.64	13-4000	34.7	6.50	I	2	L	In	Al	C	78.7	42.5	4.00/15	abce	..Up	N	SP	U	Hs	4	Y	SB	4.90	sp	R	F	H	N	661
Fiat Balilla	4-2.56x2.95	24-3800	60.7	6.50	I	3	L	In	Al	C	90.6	47.2	4.00/17	abce	..Up	N	SP	U	Hs	4	Y	SB	5.10	sp	R	N	H	N	981
Fiat Balilla Sport	4-2.56x2.95	36-4400	60.7	7.10	I	3	I	In	Al	C	90.6	47.2	4.00/17	abce	..Up	N	SP	U	Hs	4	Y	SB	4.30	sp	R	N	H	N	1014
Fiat 1500	6-2.56x2.95	45-4400	91.1	5.85	I	4	I	In	Al	C	110.2	52.9	5.00/17	abce	..Do	N	SP	U	Hs	4	Y	SB	4.40	sp	R	F	H	N	1301
Isotta Fraschini 8B	8-3.74x5.12	110-2400	449.5	5.00	I	..	I	Se	Al	T	145.7	67.7	32/6.75	abcde	..Do	..	MD	S	Hs	4	Y	TB	3.75	..	R	..	M	Y	3527
Lancia Aprilia	4-2.83x3.27	47-4000	82.5	5.70	V	3	I	In	Al	C	108.3	49.6	140/40	abce	..Up	N	SP	U	Hs	4	N	Hy	4.10	sp	R	A	H	N	1279
Lancia Astura	8-2.94x3.35	85-4000	181.3	5.35	V	5	I	In	Al	C	104.3	48.4	15/45	abce	..Up	N	SP	U	Hs	4	N	Hy	4.77	sp	R	F	H	N	1323
Lancia Dilambda	8-3.13x3.94	100-4000	241.6	5.25	V	5	I	In	Al	C	136.8	56.7	140/40	abce	..Up	N	SP	U	Hs	4	N	Hy	4.58	sp	R	F	M	Y	2976
Lancia Dilambda, short	8-3.13x3.94	100-4000	241.6	5.25	V	5	I	In	Al	C	129.5	56.7	140/40	abce	..Up	N	SP	U	Hs	4	N	Hy	4.45	sp	R	F	M	Y	2866
Maserati 4CM1100	4-2.56x3.23	105-6500	67.4	5.00	I	3	I	In	Al	S	94.5	47.2	5.50/16	abce	..Up	N	SP	U	Hs	4	N	SB	.....	sp	R	N	H	N	1433
Maserati 4CS1100	4-2.56x3.23	75-5800	67.4	....	I	3	I	In	Al	S	94.5	47.2	5.50/16	abce	..Up	N	SP	U	Hs	4	N	SB	.....	sp	R	N	H	N	1587
Maserati 4CM1500	4-2.72x3.94	125-1800	91.3	5.50	I	3	I	In	Al	S	94.5	47.2	6.00/16	abce	..Up	N	SP	U	Hs	4	N	SB	.....	sp	R	N	H	N	1433
Maserati 4CS1500	4-2.72x3.94	90-5300	91.3	....	I	3	I	In	Al	S	94.5	47.2	6.00/16	abce	..Up	N	SP	U	Hs	4	N	SB	.....	sp	R	N	H	N	1609
Maserati 4C2500	4-3.31x4.41	140-5000	151.5	4.00	I	3	I	In	Al	S	98.0	47.2	6.00/16	abce	..Up	N	SP	U	Hs	4	N	SB	.....	sp	R	F	H	N	1433
Maserati 6C1500	6-2.56x2.95	6500	91.0	....	I	4	I	In	Al	S	98.0	47.2	6.00/16	abce	..Up	N	MD	U	Hs	4	N	SB	.....	sp	R	F	H	N	1433
Maserati V8RI	8-3.31x4.25	400-5200	292.1	....	V	3	I	Se	Al	S	100.8	51.2	7.00/19	abce	..Up	Y	SP	U	Hs	4	N	SB	.....	sp	R	A	H	N	1653
JAPANESE																													
Datsun 15	4-2.17x2.99	16-3600	44.1	5.40	I	2	L	In	Y	B	79.0	41.3	4.00/16	a	..Dd	N	SP	U	Hs	3	N	SB	6.50	sp	R	N	M	N	904
Kawasaki Rokko, KP25A	8-3.19x4.53	66-1800	.....	5.00	...	L	...	...	...	...	...	...	...	...	.....	N	SP	..	Hs	3	N	SB	4.36	sp	...	...	M	..	2250
Nippon Sharyo Atsuta	8-3.00x4.25	85-3600	239.1	5.25	...	...	I	...	...	...	...	...	...	...	.....	Do	N	SP	..	Hs	3	...	SB	4.73	...	R	N	M	N	1800
Nisson 6	6-3.23x4.49	85-3400	223.9	6.50	I	7	L	In	Als	C	110.0	56.7	6.00/16	abce	1-Do	..	SP	U	Hs	3	...	SB	4.09	sp	R	..	M	..	1984
Miyata BA	2-2.93x3.31	16-3700	44.5	4.91	V	R	L	Se	Al	H	74.0	40.2	4.00/16	cylinder	..Do	N	SP	U	Hs	3	N	Wo	6.50*	sp	F	A	M	N	772
Ota OC	4-2.38x2.52	15-3600	44.9	5.50	I	2	L	In	Al	H	78.7	41.1	25/400	a	1-Do	..	SP	U	Hs	3	..	SB	6.50	sp	R	N	M	N	882
Ota K-7	4-2.38x2.52	15-3600	44.9	5.50	I	2	L	In	Al	H	78.7	41.1	4.00/17	a	1-Do	..	SP	U	Hs	3	N	SB	6.10	sp	R	N	M	N	926
Raito (Light) L-T	4-2.17x3.03	16-3800	44.7	5.60	I	3	L	In	Al	H	74.8	40.0	4.00/16	abc	1-Do	N	SP	U	Hs	3	Y	SB	5.80	sp	R	..	M	N	816
Toyota AA, BA	6-3.31x4.02	65-3000	206.8	5.42	I	3	I	In	Cl	H	112.2	57.1	5.50/28	abce	1-Do	N	SP	S	Hs	3	N	SB	4.11	sp	R	N	H	N	3310
Tsukuba M-104	4-2.16x2.99	15-3500	44.1	6.00	V	3	L	In	Al	H	74.8	39.4	4.00/18	b	1-Do	N	SP	U	Hs	3	N	Wo	.....	sp	F	F	M	N	847

CONTINENTAL PASSENGER CARS

(1)—Unlimited.
(2)—Direct to front wheels from secondary shaft off engine.
°—Others also.
†—Tin plated on Aluminum with steel struts (pistons).
*—Front axle
A—All four wheels
a—Main bearings
Al—Aluminum alloy
Als—Aluminum alloy with steel struts
Au—Automatic
b—Camshaft bearings
B—Bevel gear
B—Mechanical and hydraulic (brakes)
c—Connecting rod bearings
C—Chain
Cl—Cast iron
d—Piston pins
D—Double sleeve (valves)
D—Direct, total ratio varying automatically from $\frac{1}{1}$ to $\frac{1}{2.2}$
DC—Double plate, centrifugal
Dd—Dual downdraft
Do—Downdraft
Dp—Double plate, dry
e—Chain or timing gears
E—Electromagnetic
F—In head and side, F-Head (valves)
F—Front wheels
H—Helical gear
H—Hydraulic (brakes)
Ho—Horizontal (carburetor)
Hs—Hand shift
Hy—Hypoid gear
I—In line (cylinders)
I—In head (valves)
In—Integral with cylinders
L—At side (L-Head)
M—Mechanical (brakes)
MD—Multiple disk, dry
N—No or None
O—Horizontally opposed
Pe—Preselective
R—Rear wheels
R—Radial roller bearings
S—Spur gear (camshaft)
S—Separate from engine
Se—Separate casting from cylinders
SB—Spiral bevel
SO—Single plate operating in oil
sp—Springs
SP—Single plate, dry
St—Steel
T—Opposite (T-Head)
ta—Torque arm
TB—Straight bevel
tt—Torque tube
U—Unit with engine
Up—Updraft
V—V-Type
Wo—Worm
Y—Yes
Y—Y-alloy with solid strut

Cabins for Stratosphere Planes

IN a paper presented at the Aerotechnical Convention held in Paris recently, Henry Farman dealt with development work on a cabin for stratosphere planes.

One of the problems involved is that of a chamber of minimum weight which will remain air-tight under an internal over-pressure of about 1 atm. It must have an entrance which can be closed hermetically, and space must be provided for portholes to assure adequate vision to the pilot.

For a cabin to carry the pilot only, the form of a circular cylinder with domed heads was decided upon, of approximately 40 in. diameter by 70 in. length, and provided at the rear upper part with a sort of detachable pavillion to serve as a means of entry and to accommodate the pilot's head when in the normal flying position. It was found practical to make this pavillion of 0.040-in. sheet duralumin, by suitably stiffening it by braces.

A rather more delicate problem was that of the design of the portholes, the choice of glass for same, its thickness, and the arrangement of the joints so they would withstand the internal pressure at temperatures ranging from plus 100 to minus 75 deg. Fahr. This

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MECHANICAL SPECIFICATIONS OF

MAKE AND MODEL	ENGINE										GENERAL				FUEL SYSTEM			TRANSMISSION				REAR AXLE					Brakes		
	Number of Cylinders Bore and Stroke (Ins.)	Maximum Brake HP at Specified R.P.M.	Piston Displacement (Cu. Ins.)	Compression Ratio (To 1)	Cylinder Arrangement	No. of Main Bearings	Valve Location	Crankcase Type	Piston Material	Camshaft Drive	Wheelbase (Ins.)	Tread—Rear (Ins.)	Tires (Ins. or Metric)	Oil Pressure to—	No. Used and Type of Carburetor	Supercharged	Clutch Type	Location	Type	No. of Forward Speeds	Synchronizing Clutches	Final Drive	Gear Ratio—to 1	Torque taken by	Drive on	Independent Suspension	Service	Servo Unit Fitted	Chassis Weight (Lbs.)
A.C. 16/60	6–2.56x3.94	63–4250	121.5	6.00	I	5	I	Se	Al	C	115	50	5.50/19	abce	3–	N	SP	U	Hs	4	Y	SB	4.50	sp	R	N	M	Y	1820
A.C. 16/70	6–2.56x3.94	72–4250	121.5	7.00	I	5	I	Se	Al	C	115	50	5.00/19	abce	3–	N	SP	U	Hs	4	Y	SB	4.50	sp	R	N	M	Y	1820
A.C. 16/80 Sports	6–2.56x3.94	81–4250	121.5	7.50	I	5	I	Se	Al	C	106	50	5.00/19	abce	3–	N	SP	U	Hs	4	Y	SB	4.25	sp	R	N	M	Y	1792
Alvis Crested Eagle (SWB)	6–2.87x4.33	87–4200	168.4	6.20	I	4	I	Se	Al	C	123	56	6.00/19	abc	3–Ho	N	SP	S	Hs	4	Y	SB	5.22	sp	R	F	M	N	2660
Alvis Crested Eagle (LWB)	6–2.87x4.33	87–4200	168.4	6.20	I	4	I	Se	Al	C	132	56	6.00/19	abce	3–Ho	N	SP	S	Hs	4	Y	SB	5.22	sp	R	F	M	N	2660
Alvis Seventeen	6–2.66x4.33	68–4200	144.1	6.20	I	4	I	In	Al	C	120	56	6.50/16	abce	3–Ho	N	SP	U	Hs	4	Y	Hy	5.22	sp	R	F	M	N	2240
Alvis Speed Twentyfive	6–3.27x4.33	110–3800	217.8	6.35	I	7	I	Se	Al	C	124	56	5.50/19	abce	3–Ho	N	SP	S	Hs	4	Y	SB	4.11	sp	R	F	M	N	2576
Alvis Twentyfive (LWB)	6–3.27x4.33	110–3800	217.8	6.35	I	7	I	Se	Al	C	132	56	6.00/19	abce	3–Ho	N	SP	S	Hs	4	Y	SB	4.55	sp	R	F	M	N	2660
Alvis Twentyfive (SWB)	6–3.27x4.33	110–3800	217.8	6.35	I	7	I	Se	Al	C	123	56	6.00/19	abce	3–Ho	N	SP	S	Hs	4	Y	SB	4.55	sp	R	F	M	N	2660
Alvis 4.3 Litre	6–3.62x4.33	123–3600	267.6	6.25	I	7	I	Se	Al	C	127	56	5.50/19	abce	3–Ho	N	SP	S	Hs	4	Y	SB	4.11	sp	R	F	M	Y	2660
Armstrong Siddeley 14 hp	6–2.40x3.75		101.8	6.00	I	4	I	In	Als	C	108	51	5.75/16	abce	1–Ho	N	SC	S	Pp	4		SB	5.33	tt	R	N	M	N	
Armstrong Siddeley 17 hp	6–2.62x4.50		146.1	5.75	I	4	I	In	Als	C	g	h	i	abce	1–Do	N	SC	S	Pp	4		SB	5.33°	sp	R	N	M	N	
Armstrong Siddeley 20/25 hp	6–3.25x4.50		224.0	5.50	I	4	I	In	Als	C	k	58	l	abce	1–Ho	N	SC	S	Pp	4		SB	4.10°	sp	R	N	M	N	
Armstrong Siddeley Sid. Special	6–3.50x5.25		303.0	5.30	I	7	I	Se	Als	H	m	58	6.50/19	abce	2–Ho	N	SP	S	Pp	4		SB	4.10	tt	R		M	Y	
Aston Martin Long Chassis	4–3.07x4.02		118.9	7.75	I	3	I	In	Al	C	116	54½	5.25/18	abce	2–Ho	N	SP	U	Hs	4	Y	SB	4.67	sp	R	N	M	N	2072
Aston Martin Speed Model	4–3.07x4.02		118.9	7.75	I	3	I	In	Al	C	116	54½	5.25/18	abce	2–Ho	N	SP	U	Hs	4	Y	SB	4.44	sp	R	N	M	N	1904
Austin 7 hp	4–2.20x3.00	17–3800	45.6	6.00	I	3	L	Se	Al	H	81	43	4.00/17	ab	1–Ho	N	SP	U	Hs	4	Y	SB	5.25	tt	R	N	M	N	770
Austin 10 hp	4–2.50x3.50	21–3400	68.7	5.75	I	3	L	In	Al	C	93¾	46½	5.25/16	abce	1–Do	N	SP	U	Hs	4	Y	SB	5.25	sp	R	N	M	N	1232
Austin Light 12/4	4–2.73x4.00	33–3600	93.6	5.47	I	3	L	In	Al	C	106¼	53⅝	5.75/16	abce	1–Do	N	SP	U	Hs	4	Y	SB	4.89	sp	R	N	M	N	1526
Austin Fourteen	6–2.58x3.33	39–3800	104.4	5.71	I	4	L	In	Al	C	111¾	53⅝	5.75/16	abce	1–Do	N	SP	U	Hs	4	Y	SB	5.37	sp	R	N	M	N	1617
Austin 18 hp	6–2.73x4.37	46–3200	153.7	5.69	I	4	L	In	Al	C	n	56⅝	6.50/16	abce	1–Do	N	SP	U	Hs	4	Y	SB	5.11	sp	R	N	M	N	p
Austin 20 hp	6–3.12x4.50	66–3200	207.0	5.45	I	8	L	Se	Al	C	136	57½	6.50/17	abce	1–Do	N	SP	U	Hs	4	Y	SB	4.67	sp	R	N	M	N	2765
Bentley 4¼ Litre	6–3.50x4.50	4500	259.7	6.40	I	7	I	Se	Al	H	126	56½	5.50/18	ac	2–Do	N	SP	U	Hs	4	Y	Hy	4.10	sp	R	N	M	Y	2548
Crossley Regis 1½ Litre	6–2.32x3.94	45–4200	100.0	6.00	I	4	F	In	Al	C	108½	48	5.50/16	splash	1–Do	N	DC	U	Ps	4	N	SB	5.33	sp	R	N	M	N	1544
Crossley Regis 10 hp	4–2.48x3.54	34–4200	68.4	6.00	I	3	F	In	Al	C	108½	48	5.50/16	splash	1–Do	N	DC	U	Ps	4	N	SB	5.33	sp	R	N	M	N	1484
Daimler E. 20 hp	6–2.83x4.13	62–3600	156.5	6.00	I	4	I	Se	Al	C	114	56	6.00/18	abce	1–Ho	N	Hy	U	Ps	4	Y	Wo	5.14	sp	R	N	M	Y	2350
Daimler E. 3½	8–2.83x4.13	95–3600	208.7	6.00	I	5	I	Se	Al	C	123	57	6.50/17	abce	1–Do	N	Hy	U	Ps	4	Y	Wo	4.86	sp	R	N	M	Y	2825
Daimler E.L. 24	6–3.15x4.33	75–3600	202.3	6.00	I	7	I	In	Al	C	124	57	6.50/17	abce	1–Ho	N	Hy	U	Ps	4	Y	Wo	4.86	sp	R	N	M	Y	2970
Daimler V. 4½	8–3.15x4.53	103–3600	282.1	6.00	I	9	I	In	Al	C	142	57	7.00/18	abce	1–Do	N	Hy	S	Ps	4	Y	Wo	4.38	sp	R	N	M	Y	3585
Daimler 15 hp	6–2.60x4.14	50–3600	132.1	6.50	I	4	I	In	Al	C	109½	52	5.50/17	abce	1–Ho	N	Hy	U	Ps	4	Y	Wo	4.86	sp	R	N	M	N	2020
Ford Popular 8 hp	4–2.23x3.64	23–4000	56.9	6.20	I	3	L	In	Al	H	90	45	4.50/17	abce	1–Do	N	SP	U	Hs	3	Y	SB	5.50	tt	R	N	M	N	1085
Ford DeLuxe 10 hp	4–2.50x3.64	32–4300	71.6	6.03	I	3	L	In	Al	H	90	45	4.50/17	abce	1–Do	N	SP	U	Hs	3	Y	SB	5.50	tt	R	N	M	N	1150
Ford V-8	8–2.60x3.20	63–4300	135.9	6.64	V	3	L	In	St	H	108¼	58	5.75/16	abce	1–Do	N	SP	U	Hs	3	Y	SB	4.56	tt	R	N	M	N	1920
Ford V-8	8–3.06x3.75	88–3700	221.0	6.32	V	3	L	In	St	H	112	58	6.00/16	abce	1–Do	N	SP	U	Hs	3	Y	SB	4.11	tt	R	N	M	N	2110
Hillman Minx	6–2.48x3.74	30–4100	72.3	5.96	I	3	L	In	Al	C	92	48½	5.00/16	abce	1–Do		SP	U	Hs	4	Y	SB	5.44	sp	R	N	M		1407
Hillman Eighty	6–2.95x4.72	73–3400	194.0	6.00	I	4	L	In	Al	C	126	59½	6.50/16	abcde	1–Do		SP	U	Hs	4	Y	SB	4.89	sp	R	F	M	N	2751
Hillman Hawk	6–2.95x4.72	73–3400	194.0	6.00	I	4	L	In	Al	C	108½	59½	6.50/16	abcde	1–Do		SP	U	Hs	4	Y	SB	4.54	sp	R	F	M	N	2681
Hillman Sixteen	6–2.66x4.72	56–3600	157.2	6.00	I	4	L	In	Al	C	108½	59½	6.50/16	abcde	1–Do		SP	U	Hs	4	Y	SB	4.89	sp	R	F	M	N	2667
Humber Twelve	4–2.74x4.33	42–3800	101.8	5.67	I	3	L	In	Al	C	98¾	51	5.50/17	abce	1–Do		SP	U	Hs	4	Y	SB	5.33	sp	R	N	M		2000
Humber Eighteen	6–2.74x4.72	65–3600	166.6	6.44	I	4	L	In	Al	C	124	60¼	7.00/16	abcde	1–Do		SP	U	Hs	4	Y	SB	5.00	sp	R	F	M	Y	2940
Humber Snipe	6–3.35x4.72	100–3400	249.2	5.67	I	4	L	In	Al	C	124	60¼	7.50/16	abcde	1–Do		SP	U	Hs	4	Y	SB	4.30		R	F	M	Y	3017
Humber Pullman	6–3.35x4.72	100–3400	249.2	5.67	I	4	L	In	Al	C	132	60¼	7.50/16	abcde	1–Do		SP	U	Hs	4	Y	SB	4.30	sp	R	F,	M	Y	3073
Invicta S	6–3.48x4.72	110–3200	272.5	6.00	I	4	I	Se	Al	C	118	56	6.00/19	abce	2–Up	N	SP	U		4	N	SB	3.60	sp		N	M	N	2688
Jowett 7G	2–3.03x4.00	18–3750	57.7	4.65	O	2	L	Se	Al	C	102	48½	5.00/16	ac	Ho	N	SP	U	Hs	4		SB		sp	R	N	M	Y	
Jowett 7J	4–2.49x3.62	32–4000	71.1	5.50	O	2	L	Se	Al	C	102	48½	5.25/16	ace	Do	N	SP	U	Hs	4	Y	SB		sp	R	N	M	Y	
Lagonda L.G. 45	6–3.48x4.76	140–	271.6	7.00	I	4	I	Se	Al	C	129	57¾	6.50/30.80	abc	2–Do	N	SP	S	Hs	4	Y	SB	3.58	sp	R		M	N	3052
Lagonda V12	12–2.95x3.33		273.2		V	4	I	In	Al	C	138°	60	6.50/18	abce	Do	N	SP	S	Hs	4	Y	Hy	4.27	sp	R	F	M	N	3024
Lanchester 11 hp	4–2.60x4.36	37–4200	88.1	6.25		3	I	In	Al	C	102⅝	48	5.00/18	abce	1–Ho		Hy	U	Ps	4	Y	Wo	5.43	sp	R	N	M	N	1690
Lanchester 14 hp	6–2.36x3.54	44–4400	93.1	7.00	I	4	I	Se	Al	C	102⅝	48	5.00/18	abce	1–Ho		Hy	U	Ps	4	Y	Wo	5.43	sp	R	N	M	N	1680
Lanchester E. 18 hp	6–2.83x4.13	62–3600	156.4	6.00	I	4	I	Se	Al	C	114	56	5.50/18	abce	1–Ho		Hy	U	Ps	4	Y	Wo	4.86	sp	R	N	M	N	2300
M.G. Midget T	4–2.50x4.01		78.8	6.50	I	3	I	In	Al	C	94	45	4.50/19	abc	2–Do	N	SP	U	Hs	4	Y	SB	4.87	sp	R	N	H	N	
M.G. Two Litre S	6–2.72x4.01		139.6	6.50	I	4	I	In	Al	C	123	53	5.50/18	abc	2–Do	N	SO	U	Hs	4	Y	SB	4.75	sp	R	N	H	N	2436
Morris Series I 8 hp	4–2.24x3.54	23–3800	56.0	5.80	I	3	L	In	Al	C	90	45	4.50/17	abce	1–Up	N	SP	U	Hs	3	Y	SB	5.37	sp	R	N	H	N	942
Morris Series II 10 hp	4–2.50x4.02	30–3500	78.8	5.90	I	3	L	In	Al	C	100	50	5.50/16	abce	1–Up	N	SO	U	Hs	4	Y	SB	5.37	sp	R	N	H	N	
Morris Series II 12 hp	4–2.74x4.02	34–3200	94.4	5.90	I	3	L	In	Al	C	100	50	5.50/16	abce	1–Up	N	SO	U	Hs	4	Y	SB	4.87	sp	R	N	H	N	
Morris Series II 14 hp	6–2.42x4.02	43–4000	110.9	5.90	I	4	L	In	Al	C	106	56	5.75/–	abce	1–Up	N	SO	U	Hs	4	Y	SB	5.33	sp	R	N	H	N	
Morris Series II 18 hp	6–2.71x4.02	56–3800	139.6	5.90	I	4	L	In	Al	C	117	56	6.50/16	abce	1–Up	N	SO	U	Hs	4	Y	SB	4.75	sp	R	N	H	N	
Morris Series II 25 hp	6–3.23x4.33	80–3700	212.6	5.91	I	4	L	In	Al	C	121½	56	6.00/17	abce	1–	N	SO	U	Hs	3	Y	SB	4.45	sp	R	N	H	N	2194
Railton-Hudson 28.8 hp	8–2.99x4.49	124–3800	254.2	7.00	I	5	L	In	Al	H	120°	57½	6.50/16	splash	Do	N	SO	U	Hs	3	N	SB	4.10	sp	R	N	H	N	2117
Riley 9 hp	4–2.37x3.75	35–4500	66.4	6.20	I	2	I	In	Al	H	106	48	4.50/19	abce	1–Up	N	Au	U	Ps	4	N	SB	5.75	sp	R	N	M	N	1764
Riley 1½ Litre	4–2.72x3.94	47–4500	91.2	6.00	I	3	I	In	Al	H	109	48	4.75/18	abce	1–Up	N	Au	U	Ps	4	N	SB	5.00	tt	R	N	M	N	2042
Riley 15 hp	6–2.44x3.75	50–4500	105.3	6.00	I	3	I	In	Al	H	116½	51	4.75/18	abce	1–Up	N	Au	U	Ps	4	N	SB	5.20	tt	R	N	M	N	2212
Riley V8	8–2.38x3.75	66–4500	132.9	6.00	V	3	I	In	Al	H	112½	51	5.27/17	abce	Do	N	Au	U	Ps	4	N	SB	4.50	tt	R	N	M	N	2436
Rolls Royce 25/30	6–3.50x4.50	4250	259.7	6.00	I	7	I	Se	Al	H	132	56.3	6.00/19	ac	1–Do	N	SP	U	Hs	4	Y	Hy	4.55	sp	R	N	M	Y	2926
Rolls Royce Phantom III	12–3.25x4.50	4500	447.7	6.00	V	7	I	In	Al	H	142	62.6	7.00/18	ac	1–Do	N	SP	Se	Hs	4	Y	Hy	4.25	sp	R	F	M	Y	4000
Rover 10 hp	4–2.62x3.94	44–4200	84.7	5.90	I	3	I	In	Als	C	105	51½	4.75/18	abce	1–Do	N	SP	U	Hs	4	N	SB	4.88	sp	R	N	M	N	
Rover 12 hp	4–2.72x3.94	48–4200	91.3	5.90	I	3	I	In	Als	C	112	51½	5.00/18	abce	1–Do	N	SP	U	Hs	4	N	SB	4.88	sp	R	N	M	N	
Rover 14 hp	6–2.40x3.54	48–4600	96.2	6.00	I	4	I	In	Al	C	115	51½	5.25/17	abce	1–Do	N	SP	U	Hs	4	N	SB	5.22	sp	R	N	M	N	
Rover 16 hp	6–2.66x3.94	60–4200	131.0		I	4	I	In	Al	C	115	51½	5.50/17	abce	1–Do	N	SP	U	Hs	4	N	SB	4.70	sp	R	N	M	N	
Rover 20 hp	6–2.87x3.94		153.2	6.00	I	4	I	In	Al	C	115	51½	5.50/17	abce	1–Do	N	SP	U	Hs	4	N	SB	4.55	sp	R	N	M	N	
Salmson-British 14 hp	4–2.95x3.86	65–4500	105.5	6.00	I	3	I	Se	Al	T	112¼	52½	6.25/16	abce	1–Ho	N	SP	U	Hs	4	Y	SB	4.90	tt	R	F	H	N	1680
Salmson-British 12 hp	4–2.72x3.86	55–4500	90.3	6.00	I	3	I	Se	Al	T	110½	50½	5.00/18	abce	1–Ho	N	SP	U	Hs	4	Y	SB	5.20	tt	R	N	M	N	1568
Salmson-British 20/90	6–2.95x3.86	94–4500	158.3	6.40	I	4	I	In	Al	T	112¼	52½	6.25/16	abce	2–Ho	N	SP	U	Hs	4	Y	SB	4.10	tt	R	F	H	N	1792
Singer 9 hp LeMans Speed	4–2.36x3.39	39–5200	59.3	7.40	I	2	I	In	Al	C	91	44¾	4.50/18	abce	2–Do	N	SP	U	Hs	4	N	SB	5.57	sp	R	N	H	N	
Singer Twelve	4–2.68x4.13	43–4200	93.0	6.30	I	3	I	In	Al	C	103	52	5.25/16	abce	1–	N	SP	U	Hs	4	Y	SB	4.88	sp	R	N	H	N	
Singer 9 hp Sports	4–2.36x3.39	34–5000	59.3	7.40	I	2	I	In	Al	C	91	44¾	4.50/18	abce	2–Do	N	SP	U	Hs	4	N	SB	5.57	sp	R	N	H	N	
Singer Super Nine	4–2.36x3.39	26–4000	59.3	5.75	I	2	I	In	Al	C	91	44¾	5.00/16	abce	1–	N	SP	U	Hs	4	N	SB	5.57	sp	R	N	H	N	
Singer Bantam	4–2.36x3.39	26–4000	59.3	5.75	I	2	I	In	Al	C	91	44¾	4.75/17	abce	1–	N	SP	U	Hs	3	Y	SB	5.57	sp	R	N	H	N	
Singer 16 hp	6–2.56x3.94	54–4200	121.5	5.75	I	4	I	In	Al	C	108½	54½	6.00/16	abce	1–	N	MF	U	Hs	4	N	SB	5.20	sp	R	F	H	N	
S. S. Jaguar 1½ Litre	4–2.74x4.17	53–4000	98.1	6.00	I	3	L	In	Al	C	108	48	4.75/18	abcd	1–Do	N	SP	U	Hs	4	Y	SB	4.86	sp	R	N	M	N	
S. S. Jaguar 2½ Litre	6–2.87x4.17	97–4250	162.5	7.10	I	7	I	In	Als	C	119	54	5.50/18	abcd	2–Ho	N	SP	U	Hs	4	Y	SB	4.50	sp	R	N	M	N	2400
S. S. Jaguar 100	6–2.87x4.17	97–4250	162.5	7.10	I	7	I	In	Als	C	102	54	5.25/18	abcd	2–Ho	N	SP	U	Hs	4	Y	SB	4.00	sp	R	N	M	N	
Standard Nine	4–2.36x3.94	30–4000	69.0	6.50	I	3	L	In	Al	C	85	46	5.00/16	abcr	1–Do	N	SP	U	Hs	4	Y	SB	5.43	sp	R	N	M		1370
Standard Ten	4–2.50x3.94	33–4000	77.3	6.50	I		L	In	Al	C	90	46	5.25/16	abcr	1–Do	N	SP	U	Hs	4	Y	SB	5.29	sp	R	N	M	N	1400
Standard Twelve	4–2.74x4.17	44–4000	98.1	6.50	I	3	L	In	Al	C	100	48	5.25/16	abcdr	1–Do	N	SP	U	Hs	4	Y	SB	4.86	sp	R	N	M	N	1540
Standard Twelve with 10 hp	4–2.50x4.17	35–4000	81.9	6.50	I	3	L	In	Al	C	100	48	5.25/16	abcdr	1–Do	N	SP	U	Hs	4	Y	SB	5.43	sp	R	N	M	N	1540
Standard Fourteen	4–2.87x4.17	49–4000	108.3	6.50	I	3	L	In	Al	C	108	52	5.75/16	abcdr	1–Do	N	SP	U	Hs	4	Y	SB	5.25	sp	R	N	M	N	
Standard Fourteen with 12 hp	4–2.74x4.17	44–4000	98.1	6.50	I	3	L	In	Al	C	108	52	5.75/16	abcdr	1–Do	N	SP	U	Hs	4	Y	SB	5.37	sp	R	N	M	N	
Standard Twenty	6–2.87x4.17	65–3800	162.5	6.50	I	7	L	In	Al	C	116	52	6.00/16	abcder	1–Do	Y	SP	U	Hs	4	Y	SB	4.75	sp	R	N	M	N	
Standard Twenty with 16 hp	6–2.58x4.17	56–4000	130.7	6.50	I	7	L	In	Al	C	116	52	6.00/16	abcder	1–Do	Y	SP	U	Hs	4	Y	SB	5.00	sp	R	N	M	N	
Standard V-8	8–2.50x4.17	75–4000	163.8	6.50	V	3	L	In	Al	C	102	52	5.75/16	abce	1–Dd	N	SP	U	Hs	4	Y	SB	4.75	sp	R	N	M	N	2030
Sunbeam Thirty Continental	8–3.15x4.41	150–4500	274.7	6.20	I	10	I	In	Al	B	124	60¼	7.00/17	abc	2–Do	N	SP	U	Hs	4	Y	SB	4.09	sp	R	F	M	Y	
Sunbeam Thirty	8–3.15x4.41	150–4500	274.7	6.20	I	10	I	In	Al	H	136¼	60¼	7.00/17	abc	2–Do	N	SP	U	Hs	4	Y	SB	4.27	sp	R	F	M	Y	
Triumph 14/60 Dolomite	4–2.95x3.94	60–4500	107.8	6.60	I	3	I	In	Al	C	110	52½	5.50/17	abce	2–	N	SP	U	Hs	4	N	SB	4.75	sp	R		H	N	1520
Triumph 14/60 Vittessee	4–2.95x3.94	60–4500	107.8	6.60	I	3	I	In	Al	C	108	50½	5.00/17	abce	2–	N	SP	U	Hs	4	N	SB	4.75	sp	R		H	N	1520
Triumph Cont. & Dolo. 2 Litre	6–2.56x3.94	72–4500	121.4	6.80	I	4	I	In	Al	C	116	52½	5.50/17	abce	2–	N	SP	U	Hs	4	N	SB	4.50	sp	R		H	N	1620
Triumph 2 Litre Vittessee	6–2.56x3.94	72–4500	121.4	6.80	I	4	I	In	Al	C	116	50½	5.25/17	abce	2–	N	SP	U	Hs	4	N	SB	4.50	sp	R		H	N	1620
Vauxhall Twelve DY	6–2.24x3.94	36–4000	93.4	6.25	I	4	I	In	Al	C	101	50	5.50/16	abcde	1–Do	N	SP	U	Hs	4	Y	SB	4.77	sp	R	F	M	N	1715

BRITISH PASSENGER CARS

MAKE AND MODEL	ENGINE									GENERAL				FUEL SYSTEM			TRANSMISSION			REAR AXLE					Brakes		
	Number of Cylinders Bore and Stroke (Ins.)	Maximum Brake HP at Specified R.P.M.	Piston Displacement (Cu. Ins.)	Compression Ratio (To 1)	Cylinder Arrangement	No. of Main Bearings	Valve Location	Crankcase Type	Piston Material	Camshaft Drive	Wheelbase (Ins.)	Tread—Rear (Ins.)	Tires (Ins. or Metric)	Oil Pressure to—	No. Used and Type of Carburetor	Supercharged	Clutch Type	Location	Type	No. of Forward Speeds	Synchronizing Clutches	Final Drive	Gear Ratio—to 1	Torque taken by	Drive on	Independent Suspension	Service	Servo Unit Fitted	Chassis Weight (Lbs.)
Vauxhall.....Fourteen DX	6-2.42x3.94	42-3500	108.8	6.25	I	4	I	In	Al	C	101	50	5.50/16	abcde	1-Do	N	SP	U	Hs	4	Y	SB	4.77	sp	R	F	M	N	1715
Vauxhall.....Twenty-five GY	6-3.23x4.00	80-3600	196.1	6.10	I	4	I	In	Als	C	111	57½	6.25/16	abcde	1-Do	N	SP	U	Hs	4	Y	SB	4.44	sp	R	F	H	N	2330
Vauxhall.....Twenty-five GL	6-3.23x4.00	80-3600	196.1	6.10	I	4	I	In	Als	C	130	57½	6.50/16	abcde	1-Do	N	SP	U	Hs	4	Y	SB	4.44	sp	R	F	H	N	2370
Wolseley.....10/40	4-2.50x4.02	41-4200	78.8	6.00	I	3	I	In	Bl	C	100	50	5.75/16	abc	1-Do	N	SO	U	Hs	4	Y	SB	5.22	sp	R	...	H	N	1442
Wolseley.....12/48	4-2.74x4.02	48-4200	94.4	6.00	I	3	I	In	Bl	C	100	50	5.75/16	abc	1-Do	N	SO	U	Hs	4	...	SB	5.22	sp	R	...	H	N	1491
Wolseley.....14/56	6-2.42x4.02	56-4400	110.9	6.30	I	4	I	In	Bi	C	106	56	6.00/16	abc	2-Do	...	SO	U	Hs	4	Y	SB	5.33	sp	R	...	H	N	2093
Wolseley.....16	6-2.58x4.02	64-4200	125.8	6.00	I	4	I	In	Bi	C	117	56	6.50/16	abc	2-Do	N	SO	U	Hs	4	Y	SB	5.27	sp	R	...	H	N	2303
Wolseley.....21	6-2.95x4.33	81-3800	177.9	6.00	I	4	I	In	Bi	C	121½	56	6.50/16	abc	2-Do	N	SO	U	Hs	4	Y	SB	4.45	sp	R	...	H	N	2457
Wolseley.....25 Super Six	6-3.23x4.33	100-3800	212.6	6.00	I	4	I	In	Bi	C	121½	56	6.50/16	abc	2-Do	N	SO	U	Hs	4	Y	SB	4.45	sp	R	...	H	N	2457
Wolseley.....25 Salon de Ville	6-3.23x4.33	100-3800	212.6	6.00	I	4	I	In	Bi	C	121½	61	6.50/16	abc	2-Do	N	SO	U	Hs	4	Y	SB	4.45	sp	R	...	H	N	3836‡
Wolseley.....25 LWB	6-3.23x4.33	100-3800	212.6	6.00	I	4	I	In	Bi	C	145¼	61	7.00/16	abc	2-Do	N	SO	U	Hs	4	Y	SB	4.45	sp	R	...	H	N	3045

BRITISH PASSENGER CARS

°—Others also
‡—Complete car weight
a—Main bearings
Al—Aluminum alloy
Als—Aluminum alloy with steel struts
Au—Automatic
b—Camshaft bearings
B—Bevel gear
Bl—Bi-Metal
c—Connecting rod bearings
C—Chain
d—Piston pins
DC—Double plate, centrifugal
Dd—Dual downdraft
Do—Downdraft
e—Chain or timing gears
F—In head and side, F-head (valves)
F—Front wheels
g—111, 116 and 123
h—52 and 57
H—Helical gear
H—Hydraulic (brakes)
Ho—Horizontal (carburetor)
Hs—Hand shift
Hy—Hypoid gear
I—In line (cylinders)
I—In head (valves)
In—Integral with cylinders
j—5.25/19, 5.50/17 and 6.00/17
k—123½ and 131½ inches
l—6.00/17 and 6.50/18
L—At side (L-head)
m—135½ and 144 inches
M—Mechanical (brakes)
MF—Multiple disk with fluid drive
n—112 or 120
N—No or None
O—Horizontally opposed
p—2114 lbs. with 112 wb., 2135 lbs. with 120 wb.
Pp—Preselective, planetary type
Ps—Preselective
r—Tappet stems
R—Rear wheels
S—Separate from engine
Se—Separate casting from cylinders
SB—Spiral Bevel
SC—Single plate, centrifugal
SO—Single plate operating in oil
sp—Springs
SP—Single plate, dry
St—Steel
T—Shaft (Camshaft drive)
tt—Torque tube
U—Unit with engine
Up—Updraft
V—V-type
Wo—Worm
Y—Yes

Cabins for Stratosphere Planes

(*Continued from page* 429)

choice could be made only after numerous trials, accompanied by explosions, some of them of a quite dangerous nature.

It was next necessary to study the problem of bringing the controls into the cabin in such a manner that the air-tightness of the walls would not be impaired. It was finally decided to make use of rods in torsion only, provided with stuffing boxes that are absolutely air-tight.

Once air-tightness was assured it became necessary to study the problem of regulating the air pressure in the cabin. A double system was finally adopted, comprising a sluice gate manipulated by the pilot and an automatic valve adjustable on the ground, which limits the overpressure in the cabin to a value depending on the altitude which it is planned to attain.

A complete study had to be made also of means of supplying the cabin with fresh air. At first this was accomplished by means of an air pump driven by the engine directly. This system had to be abandoned because of the oily vapors carried into the cabin with the air. It was replaced by a system in which the air pump is located in the cabin and is driven from the engine through a suitable transmission. As a result of its compression and the location of the suction pipe, the air arrives in the cabin at normal temperature. Moreover, the location chosen for the discharge obviates the risk of dew from the exhalations of the pilot forming on the porthole windows and obstructing his view.

After all these preliminary tests the complete cabin, with all accessories in place, was subjected to an assembly test in the pneumatic bell of Dr. Garsaux.

Automotive Research

Kraftfahrtechnische Forschungsarbeiten (Automotive Research Projects), Nos. 3 and 4. Published by VDI Verlag, G.m.b.H. Berlin NW 7, Germany.

NO. 3 of the automotive research bulletins contains four reports on research projects, as follows: Investigation of the Combustion Process of German Heavy Oils in a Combustion Bomb, by Dipl.-Ing. Reinhard Müller; Noise Problems Connected with Motor Vehicles, by Prof. Dr.-Ing. W. Kamm and O. Hoffmeister; Further Developments of the Glowlamp Transportation-Noise Meter, by Prof. Dr.-Ing. A. Reinsch and Dr.-Ing. U. Schmidt; Investigation on the Smokiness of Exhaust Gases (from Diesel engines), by P. Riekert and H. Ernst, Stuttgart.

Bulletin 4 also contains four reports, as follows: Investigation of the Structural Rigidity of a Self-Contained Vehicle Body in Shell Form, by Prof. Dr.-Ing. W. Kamm. Dr.-Ing. P. Riekert, and Dipl.-Ing. W. Krautter; Tests on a Six-Cylinder Air-Cooled Engine with Closed Air Passage, by Dr.-Ing. W. Kamm, Dipl.-Ing. P. Riekert, Dipl.-Ing. F. von Stotzingen and Ing. K. Schopper; Development of an Automatic Fuel Meter (for dynamometer installations), by Prof. Dr.-Ing. A. Reinsch and Dr.-Ing. U. Schmidt; Tests on Rear Number Plates of Automobiles, by Prof. Dr.-Ing. Reinsch and Dr.-Ing. U. Schmidt.

The reports are in German.

Reciprocal Tariff Act in Force for 3 More Years

The reciprocal tariff act, strongly supported by the automotive industry, has been extended for three years beginning June 12. The legislation, recently passed by Congress without change, was signed March 1 by President Roosevelt.

Pioneer Inventor in Automotive Field Patents Mechanical Transmission

A TYPE of hydro-mechanical transmission for automobiles has been patented by Carl W. Weiss of Brooklyn, well known as one of the pioneers of the internal-combustion engine industry and inventor of the Weiss constant-velocity universal joint. It comprises a direct drive, which is to be used under most operating conditions, together with torque-multiplying means for acceleration and hill-climbing. These latter include a three-element hydraulic unit together with a planetary assembly. A reversing gear of the sliding type is incorporated with the torque converter. The change from direct to indirect drive, or vice versa, is effected automatically.

The transmission is shown in longitudinal section in the accompanying drawing. *A* is a member which is bolted to the flywheel flange of the engine crankshaft, to the impeller *E* of the hydraulic unit, and to the housing *F*. The hydraulic unit also contains two other elements, the rotor *G*, which is splined to the driven shaft *B* at its forward end, and the reaction rotor *H*, which is secured to a flange on sleeve *S*. On the rear end of this sleeve the sun pinion *T* is mounted.

Assume that the crankshaft and housing *A* rotate in the clockwise direction. The vanes of impeller *E* are set at an angle to the impeller plane, so as to throw the liquid forward in the direction of rotation, at a velocity higher than the tip velocity of the impeller. The vanes of impeller *E* and rotor *G* are of similar form and their inclinations to the plane of motion are indicated by the dotted lines immediately below the axis of the hydraulic unit.

When the car is at rest or running at a very low speed, rotor *G* is at rest or turning at a very low speed, and the fluid from impeller *E* impinging against its blades impresses a clockwise torque on rotor *G*, which, as already stated, is secured to the driven shaft *B*.

Upon impinging against the vanes of rotor *G*, the fluid is reflected or has its direction of motion reversed, and upon striking the vanes of reaction rotor *H* it impresses a counterclockwise torque on that rotor. Reaction rotor *H* is bolted to the sleeve *S* which at its rear end carries the sun pinion *T* of a planetary assembly. Pinion *T* being under the influence of a counterclockwise torque, tends to carry the planetary carrier *I* around with it in the counterclockwise direction, but is prevented from doing so by the roller clutch *MNO*, one member of which is secured to the housing of the transmission. Therefore, the planetary carrier remains stationary and counterclockwise rotation of pinion *T* produces clockwise rotation of the internal gear *L* through the intermediary of the planetary pinion *J*. As shown in the drawing, internal gear *L* is splined to driven shaft *B* and the torque impressed on the "reaction rotor" is conveyed to driven shaft *B* in multiplied or boosted form. This torque is added to that directly impressed on shaft *B* by rotor *G*.

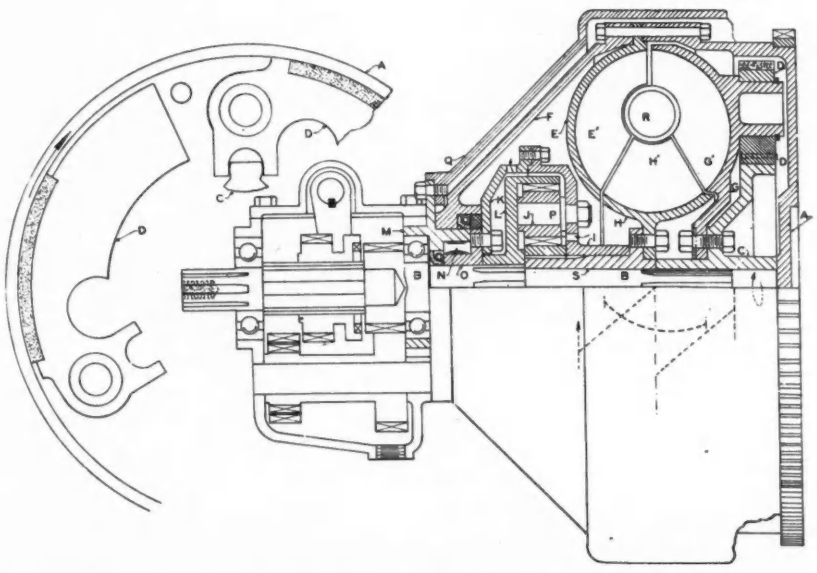
An automatic friction clutch is combined with the hydraulic unit, comprising clutch shoes *D* which are pivoted on trunnions mounted on rotor *G*. When the car has attained a given forward speed, and the rotor therefore turns at a definite r.p.m., shoes *D* engage drum *A*, locking the impeller and rotor together.

The torque on reaction rotor *H* is now in the clockwise direction, hence the direction of the reaction on the planetary carrier *I* is reversed and the planetary assembly is allowed to freewheel by the roller clutch *MNO*.

A car equipped with a transmission of this type would be controlled entirely by means of the accelerator pedal, except for the reverse gear, which could be controlled by means of a knob at the end of a pull rod extending from the dash and would have three positions, forward, neutral and reverse.

Evidently it would be quite possible to give the driver control over the speed at which the change from indirect to direct drive took place, and vice versa, by providing him with means for controlling the strength of the springs holding the centrifugal clutch out of engagement.

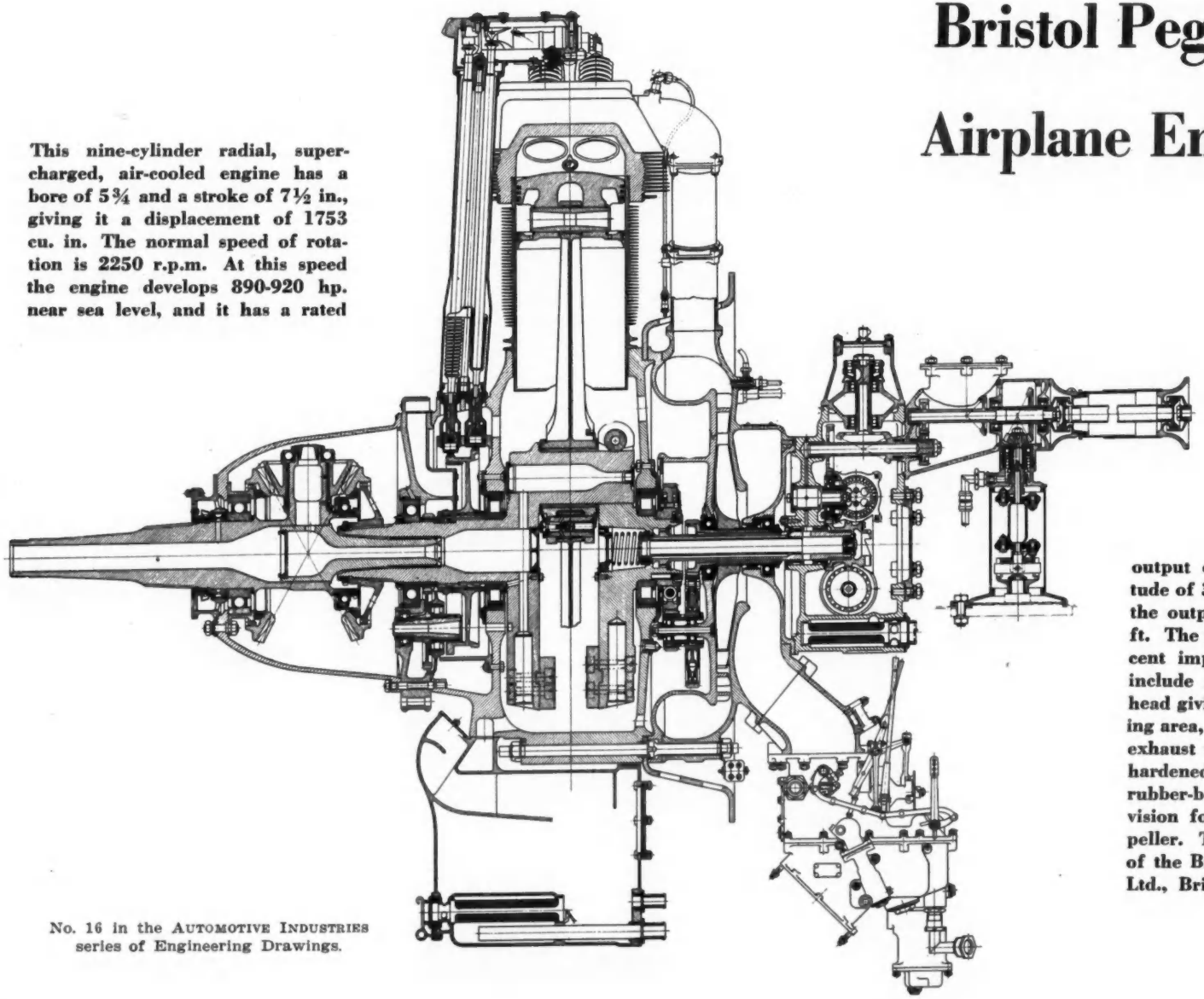
The above hydrodynamic transmission is covered by U. S. patent No. 2,005,444.



Detail drawing of the Weiss Hydro-Mechanical Transmission

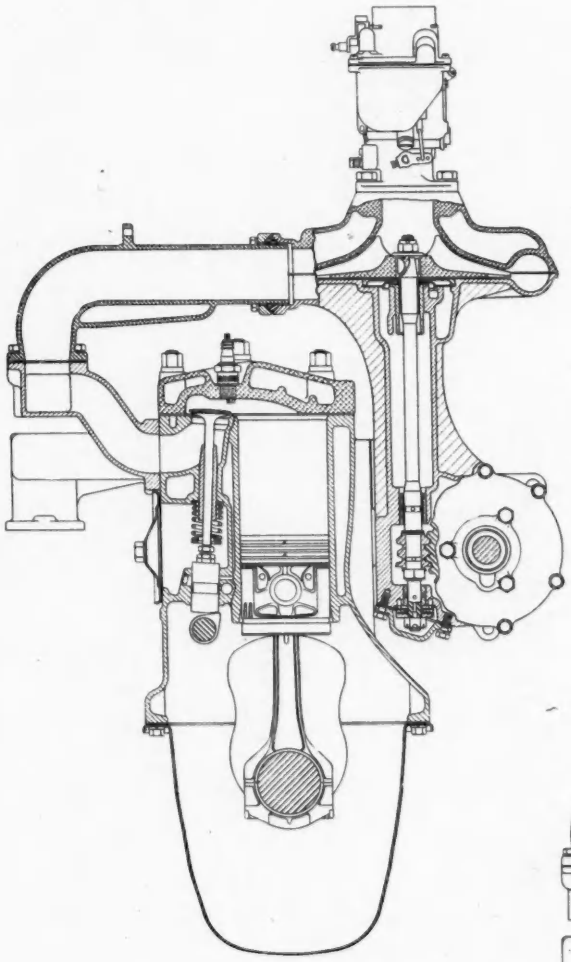
Bristol Pegasus Airplane Engine

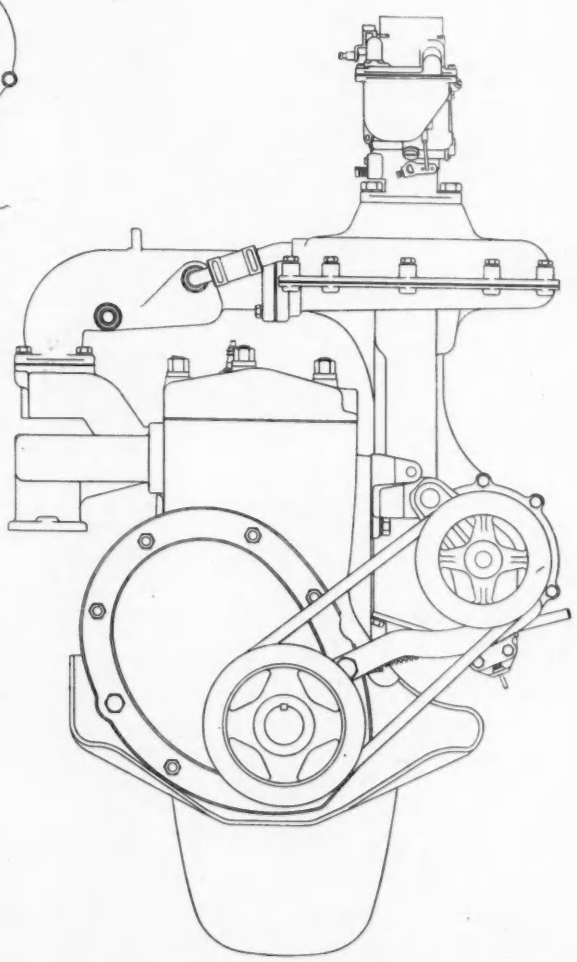
This nine-cylinder radial, supercharged, air-cooled engine has a bore of 5¾ and a stroke of 7½ in., giving it a displacement of 1753 cu. in. The normal speed of rotation is 2250 r.p.m. At this speed the engine develops 890-920 hp. near sea level, and it has a rated output of 790-820 hp. at an altitude of 3500 ft. At maximum speed the output is 840-870 hp. at 5750 ft. The net weight is 1005 lb. Recent improvements in this engine include a new aluminum cylinder head giving 40 per cent more cooling area, sodium-cooled and stellited exhaust valves, stellited valve seats, hardened steel cylinder barrels, rubber-beffer mounting, and provision for a controllable-pitch propeller. The engine is the product of the Bristol Aeroplane Company, Ltd., Bristol, England.



No. 16 in the AUTOMOTIVE INDUSTRIES series of Engineering Drawings.

Graham Supercharged Automobile Engine



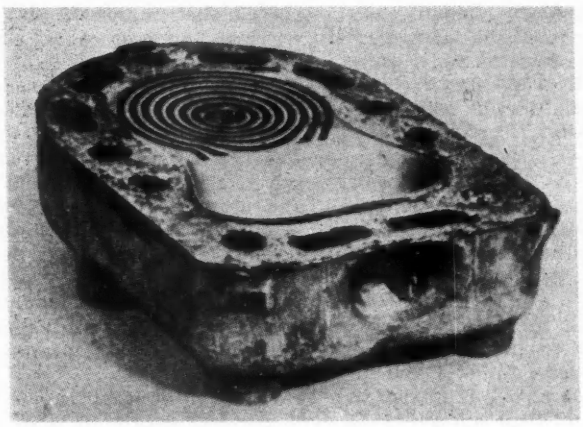


A transverse section through a cylinder axis and a front elevation of the Graham six-cylinder 3¼ by 4⅜-in. supercharged engine are shown herewith. The displacement of this engine is 217. 8 cu. in., a compression ratio of 6.7 is used, and the engine is rated 116 hp. at 4,000 r.p.m. The maximum torque of 180 lb.-ft. is developed at the relatively high speed of 3000 r.p.m. The supercharger, which is mounted at the side of the engine, is of the centrifugal type and is driven from the crankshaft through a belt drive at the forward end and a wheel and worm at the lower end of the vertical impeller shaft. The downdraft carburetor is mounted on top of the supercharger, which latter therefore handles a combustible mixture. The sectional view also shows details of the aluminum cylinder head and the method of supplying oil directly from the pressure lubrication system to the lower part of the cylinder barrel by making use of the valve tappet as a valve.

AUTOMOTIVE ABSTRACTS

Cooling Ribs on Combustion-Chamber Wall

SOME research work on the improvement of combustion chambers with a view to increasing the output and thermal efficiency of engines has been done in France by M. Serruys, who is connected with the Engineering Division of the French Air Service. M. Serruys points out that in order to improve these factors it is necessary to increase the compression ratio, which latter is limited by the tendency of the engine to detonate. To keep down detonation it is necessary to limit the temperature of the combustion-chamber



wall, and especially of that portion of it which is directly above the piston. As a means to this end, use has been made of metals or alloys of high heat conductivity for the cylinder heads. However, the surface temperatures of the cylinder wall depend not only on the ability of the head material to carry the heat absorbed to the jacket water with a low temperature gradient, but also on the capacity of the surface to absorb heat rapidly from the hot gases in contact with them.

In studying the problem experimentally it was found desirable to keep the temperatures of air, water and oil constant throughout, and the humidity of the air and the admission pressure also were kept constant in the tests for power output and fuel consumption. In tests on anti-detonating qualities, on the other hand, it was considered better to vary the charging pressure rather than to follow the more usual practice of varying the compression ratio, as the latter involves a change in the form of the combustion chamber. A series of tests were made in which the cylinder heads were made of cast iron in the first eight runs and of Alpax (an aluminum-silicon alloy) in the last three runs. Moreover, the interior surface of the cast iron cylinder heads were run successively in the "as cast state" and polished, and also with very thin coatings (0.004-0.012 in.) of aluminum, copper and chromium, sprayed on by the Schoop process. With each of these coatings one test was made without the surface being polished and one after it had been polished as highly as possible.

Finally a cylinder head of the same form cast of Alpax was run successively with the inner surface in the "as cast" condition, in the polished condition, and with the part over the piston striated or grooved, as shown in the illustration reproduced herewith. This permits of separating the influence of the conductance of the metal constituting the major part of the combustion-chamber wall, the quality of the metal constituting the combustion chamber surface, and the influence of the degree of polish of this surface.

Power and economy tests were made on a 3.34 by 5.52-in. engine at 1000 and 1500 r.p.m., the inlet pressure being held at 29.92 in. of mercury column, the inlet temperature at 86 deg. F., the humidity at 80 per cent, the water-inlet temperature at 176 deg, F., and the oil temperature at 113 deg. F. The compression ratio was 5.8, the fuel was a gasoline of approximately 60 octane number, and the optimum ignition advance was used. The results obtained are given in Table I. Torques are given in kilogram-meters and specific consumptions in grams per horse power-hour. As the tests were made for comparative purposes, it was considered unnecessary to change these values to American measures.

From the foregoing it will be seen that there is an advantage in using aluminum alloy for the cylinder head (in this case a gain of 4 per cent in power) even if the compression ratio is not increased. It is also advantageous under the same conditions to remove the scale from the combustion chamber walls, but not to aim at a specular polish, the gain achieved being of the order of 1 to 2 per cent. The application of coatings of copper, aluminum, or

Table I

Nature of Cylinder Head Wall		Engine Torque 1000 r.p.m.	Engine Torque 1500 r.p.m.	Specific Consumption 1000 r.p.m.	Specific Consumption 1500 r.p.m.
Cast iron, rough		8.515	8.200	277	272.5
Cast iron, smooth		8.565	8.350	277	268.5
Cast iron, aluminum coated	dull	8.350	8.240	281	270
	polished	8.090	7.220*	292	308*
Cast iron, chromium-coated	dull	8.250	8.260	286	270
	polished	8.260	8.300	286	270
Cast iron, copper-coated	dull	8.100	8.210	287	276
	polished	8.010	7.985	286	279
Alpax	dull	8.850	8.750	282	271
	polished	8.990	8.950	272	266
	striated	8.540	8.510	286	277

*Result influenced by the partial scaling off of the aluminum coating.

Table II

Nature of Cylinder Head Wall		Engine Torque 1000 r.p.m.	Engine Torque 1500 r.p.m.	Specific Consumption 1000 r.p.m.	Specific Consumption 1500 r.p.m.
Cast iron, rough		8.870	8.380	273	268
Cast iron, smooth		9.460	8.730	259	261
Cast iron, aluminum-coated	dull	8.940	8.570	270	264
	polished	8.530	....	282	...
Cast iron, chromium-coated	dull	9.660	9.050	254	254
	polished	9.690	9.155	254	254
Cast iron, copper-coated	dull	9.700	8.890	256	262
	polished	9.580	9.140	250	257
Alpax	dull	10.750	10.675	250	240
	polished	10.790	10.640	239	247
	striated	12.250	11.600	247	256

chromium to the cast iron head reduces the efficiency, especially if the coatings are polished.

Tests for freedom from detonation were carried out under the same conditions as the previous ones, except as regards the inlet pressure, which in each case was increased until incipient knock appeared. The results are given in Table II.

From the above results the conclusions are drawn that from the anti-detonating standpoint there is a considerable advantage in having the inner surface of the cylinder head smooth but not perfectly polished; that the use of copper, chromium or aluminum coatings improves the anti-detonating characteristics of the heads only very little; that the substitution of Alpax for cast iron increases the resistance to detonation considerably, and that the use of striations or trated herewith, over a part of the combustion chamber grooves, cut in accordance with the patented method illus-wall, increases the resistance to detonation of an aluminum cylinder head materially.—*Mecanique* for March and April.

The Evolution of Permanent-Magnet Steels

PLAIN carbon steels are practically no longer used for permanent magnets. However, for many applications, chromium and tungsten high carbon steels are still chosen.

Chromium magnet steels often contain from 0.9 to 1.1 per cent carbon and 2 to 6 per cent of chromium. For some time it has been customary to add to these steels either molybdenum or tungsten in the proportion of less than 2 per cent, thus obtaining a certain improvement in the magnetic properties, which will then range substantially between the following limits: Remanence B_r, 9500 to 11,000 gauss; coercive force H_c, 50 to 75 oersteds, and $(B.H)_{max}$, 230,000 to 330,000.

The tungsten steels contain, besides 0.55 to 0.80 per cent carbon, 5 to 6.5 per cent tungsten. With about 6 per cent of tungsten and 0.55 per cent of carbon one obtains a remanent induction of 11,000 to 12,000 gauss and a coercive force of 55 to 60 oersteds; for 0.85 per cent carbon and the same proportion of tungsten, the remanence is 9000 to 9500 gauss and the coercive force, 70-75 oersteds.

Chromium and tungsten steels were surpassed considerably in power some time ago by cobalt steel, developed by K. Honda, and they are being replaced in a growing measure by this new steel. The compositions of this latter steel vary substantially between the following limits: 0.9-1.0 per cent carbon; 5 to 11 per cent chromium, and 5 to 35 per cent cobalt. To this may still be added 0.5 to 2 per cent of molybdenum. The steel which is richest in non-ferrous elements contains, besides 32 to 34 per cent cobalt, 4 to 5 per cent chromium, and 4 to 6 per cent tungsten. The magnetic characteristics of these steels vary with the composition between the following limits: Remanence, 8500 to 9500 gauss; coercive force, 100 to 250 oersteds, available-energy factor $(B.H)_{max}$, 390,000 to 950,000. These cobalt steels have been subjected to an intense scientific study in recent years and they have come into extensive us.

Next in order come alloys which contain practically no carbon, in which the magnetic hardness is obtained by structural quenching, that is to say, by precipitation in the course of an anneal, of elements maintained in a supersaturated solution, by a quench at high temperature. We are concerned here particularly with alloys containing from 10 to 20 per cent of tungsten or of molybdenum, and an addition of cobalt of less than 15 per cent. These alloys are quenched from 2280-2370 deg. F. and then given a long anneal at 1200-1290 deg. F. With these one obtains a remanent induction of 11,000 to 12,000 gauss, and a coercive force of 100 to 250 oersteds. An essential characteristic of these new alloys is that they retain their magnetic qualities up to about 1200 deg. F., whereas the best cobalt steels lose most of their magnetic quality above 575 deg. F. Magnetic constancy, which is important in all cases, suffers rapidly even on slight heating, in the cases of hardened steels of the tungsten and cobalt types.

At about the same time when the new alloys referred to in the foregoing were perfected, T. Mishima found that certain alloys of iron, nickel and aluminum attain, after a treatment corresponding to a quench and draw, magnetic qualities exceeding by far those of any previously known magnetic material. Mishima indicated that steels containing 10 to 40 per cent nickel and 5 to 20 per cent aluminum, with the possible addition of manganese, copper, tungsten and cobalt, give a remanence of 7500 to 11,000 gauss and a coercive force of 200 to 700 oersteds.

At nearly the same time K. Honda drew attention to another alloy containing 15 to 30 per cent cobalt, 10 to 25 per cent nickel, and 8 to 25 per cent titanium. Honda claimed for this alloy a remanence of 6300 to 7600 gauss and a coercive force of 780 to 920 oersteds. The alloys of Nonda, the same as those of Mishima, contain practically no carbon.

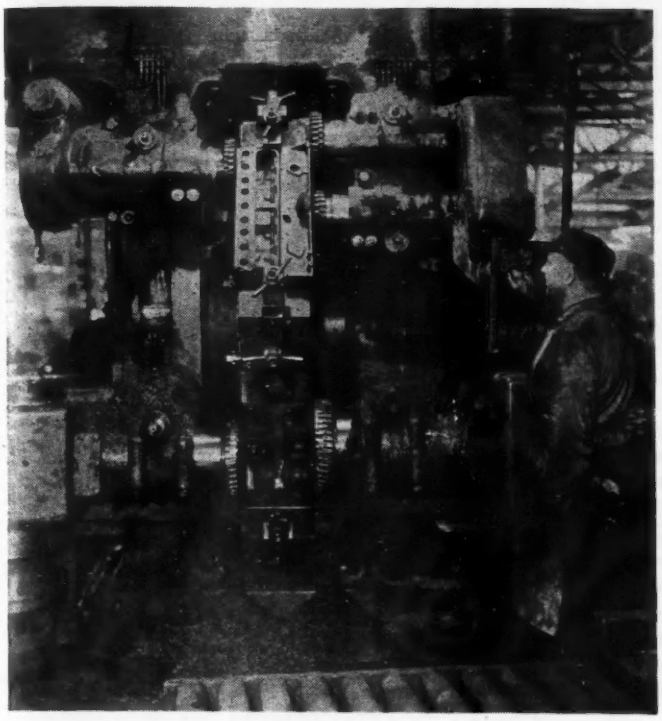
These new magnet steels are at present being manufactured and used in industry in two grades, of the following composition ranges:

1—24-28 per cent nickel and 12-16 per cent aluminum.

2—24.5-30 per cent nickel, 9-13 per cent aluminum, 5-10 per cent cobalt.—*La Technique Moderne.*

A New Synthetic Fuel

A NEW process for the production of synthetic gasoline was described before the Chemical Society of France by M. Desparmet, chemical engineer of the Lyon school. M. Desparmet starts with coke from which he produces calcium carbide. The latter when reacting with water furnishes acetylene. The acetylene is transformed into ethylene, and after a number of additional transformations synthetic gasoline is obtained. One difference between the Desparmet and other processes for the synthetic production of motor fuel is said to be that the former is operated at atmospheric pressures and temperatures. The cost of gasoline on its entry into France is about 7.5 cents per gallon and the import duty adds about the same amount, hence it must be possible to manufacture the synthetic gasoline for about 15 cents per gallon.—*Revue des Agents.*



Production Lines

A battery of giant milling machines turning out Chrysler cylinder blocks. Five blocks are mounted on the wheel-like center carriage. The three upper cutters or milling tools are used to make the first rough cut on the top and bottom surfaces of the cylinder block. Then the two lower cutters put on the finish surfaces. Five times in each revolution of the center wheel a finished block is removed and another rough block put on.

Trailer Problems

That the auto-trailer is being given a lot of thought was brought home to us in the course of a conversation with a well-known chief engineer. He told us that his company has done considerable testing with auto-trailers to determine what effect such equipment may have on car design. Their work indicates that much of the heavy grade work, with a trailer behind, has to be done in second or low gear as there is insufficient engine power reserve for the extra load. This in turn imposes undue load on rear axle and transmission, the latter being affected principally because of the unusual amount of low gear work to which it may be subjected in certain localities. Apparently, the wise owner would profit by the installation of a commercial axle if he does much hill climbing. Another sericus problem is the matter of the hitch. Passenger car frames have been developed along certain lines in recent years—trending principally to lighter weight and greater torsional rigidity. Unlike truck frames, however, they do not provide a load-carrying rear cross-member and this engineer intimates that few rear cross-members have sufficient rigidity, transversely, to carry a heavy trailer load. Evidently in the interest of constructive development of the new industry, it is important to take these problems into account at the outset.

Exhaust Codes

Taking the bull by the horns, the American Foundrymen's Association has just approved and published two tentative Codes of Recommended Practice arising from the work of its Industrial Hygiene committee. One code deals with recommended practice for testing and measuring air flow in exhaust systems; the other deals with grinding, polishing, and buffing equipment sanitation. Here is the first constructive step toward the elimination of occupational hazards by engineering approach rather than by legislative impulse.

Checks Vibration

A prominent aircraft engine manufacturer building an in-line liquid-cooled engine was troubled by the breakage of the long studs used for fastening the block to the crankcase. The trouble was traced to fatigue failure of the studs due to excessive vibration of the unusually long and slender member. After routine corrective measures had failed, a close study revealed the fact that the period of vibration could be raised above the critical range by the expedient of adding mass at the center of the stud. It's a little more expensive to turn the long stud to the desired form, but if it solves the problem, it will save the engine.

Seeks Passivity

J. B. Johnson's SAE Annual Meeting paper, as well as other recent literature, indicates the growing popularity of magnesium alloy elements in aircraft engine construction. The chief problem at the moment is to develop some relatively simple but effective means of coating such parts so as to produce a corrosion-resistant surface. Atmospheric corrosion is a minor problem but since many engines may be used on sea-going craft, it is important to find an over-all solution. A number of treatments are in regular use today but there is always room for improvement. We find that some experts in this field have been at work for some time and may be in position to make an announcement of their findings very soon.

Aircraft Bearing

One of the prominent parts makers told us not long ago that judging by his company's experience, the silver bearing looks most promising for aircraft engines. Much experimental work is under way and some definite pronouncement may be forthcoming in the near future.—J. G.

MANUFACTURING MANAGEMENT METALLURGY

New DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Milling Machine

Brown & Sharpe Light Type Model Has 16 Spindle Speeds

A swiveling spindle head, spindle speeds up to 1800 r.p.m., and uniformly deep throat distance throughout the entire vertical travel are features of the new No. 2 vertical spindle milling machine (Light type) which has been announced by the Brown & Sharpe Mfg. Co., Providence, R. I.

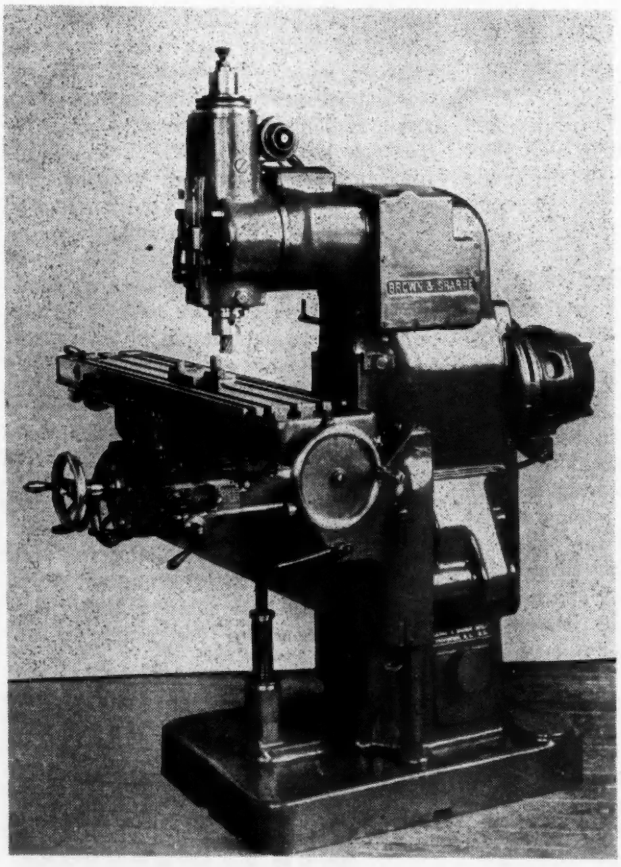
The spindle head can be set at any angle to 90 deg. on each side of vertical in a plane parallel to the table. A lever-operated locking plunger is provided for vertical realignment of the spindle head.

To facilitate set-ups when the head is swiveled the spindle is provided with an axial hand movement of 3 in. in all positions. An aluminum alloy handwheel can be transferred to a position at either side of the spindle head; and an adjustable dial at the top of the head permits adjustment of the spindle position to .001 in. The spindle can be clamped at any position in its axial movement by the lever at the lower front of the head.

Two hardened steel stops at the front of the spindle head are attached to the spindle slide and to the head respectively and are accurately ground on their facing surfaces. These stops permit the use of measuring blocks for high-precision set-ups and, where a run of duplicate parts requires machining each piece at several different depths, they permit speeding up of the job by step-milling.

The 16 spindle speeds available range from 55 to 1800 r.p.m. Sixteen changes of longitudinal, transverse and vertical power feed are independent of the spindle speeds and range from ½ in. to 18½ in. per min.

The following ranges of automatic power feed are provided: Longitudinal, 28 in.; transverse, 10 in.; vertical feed of knee, 15 in. The design of the column affords a throat distance of 12 in. throughout the entire length of vertical travel. With the spindle vertical, the greatest distance from end of spindle to top of table is 18 in.; and with the spindle horizontal, the greatest distance from center of spindle to top of table is 24¾ in.



(Left) Brown & Sharpe vertical spindle milling machine

Forging Machine

1 In. and 1½ In. Capacity With New Ajax Models

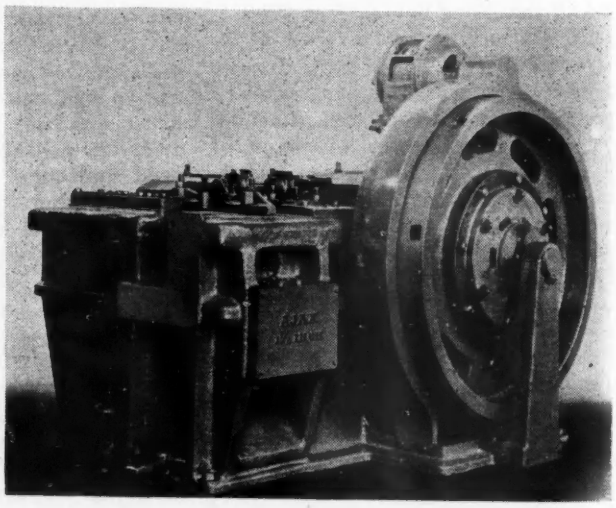
The Ajax Mfg. Co., Cleveland, Ohio, recently announced a bolt heading and upsetting forging machine in two sizes rated at 1 in. and 1½ in. capacity. The new models are equipped with the patented Ajax air clutch.

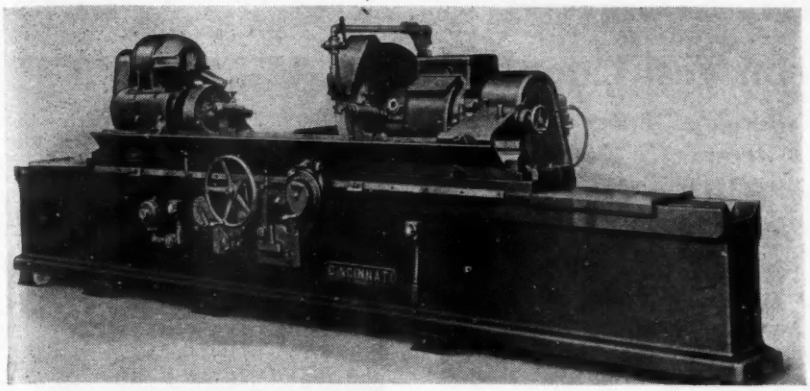
Because of the capacity and speed of the machine, the flywheel is mounted on the crankshaft and delivers ample power to drive the machine. The motor is direct-connected to the flywheel, either through a fiber pinion on the motor shaft which meshes with an integral gear on the flywheel rim or through multiple "V" belts.

When the foot pedal at the operator's position is depressed it releases the band brake, and at the same time opens the air valve to the clutch. This introduced compressed air behind an air piston, carried by the flywheel, and applies pressure directly to the friction plates, clamping them together and starting the machine. At a predetermined point in the operating cycle the air is cut off, disengaging the clutch. A cam on the rim of the brake drum then sets the brake which stops the machine accurately on open stroke.

A fully automatic safety mechanism protects the machine from damage due

(Below, right) Ajax bolt heading and forging machine





Cincinnati cylindrical grinding machine

to oversized or misplaced stock which would prevent the dies from closing. It immediately resets itself so that production is not interrupted by a shutdown which would necessitate removing the heated stock from the furnace.

Molding Machine

Plastic Injection Equipment Made by Reed-Prentice

Reed-Prentice Corp., Worcester, Mass., has brought out a new full hydraulic plastic injection molding machine which they designate as model No. 10. The machine can be operated both manually and automatically. It is operated manually with two levers, the first for closing the mold and the second for operating the horizontal plunger. Two timing control units are furnished with the fully automatic machine, one for setting the time-period for the material to solidify and one for regulating the time the molds are open for ejection of the castings. These timing units can be adjusted to give periods up to 32 sec.

A positive toggle mechanism locks the molds mechanically. Hydraulic pressure is used to open and close the molds only, and to operate the plunger cylinder.

Some of the essential specifications of the machine are: Maximum pressure per sq. in. on the material, 20,000 lb.; die opening, 8 in.; die space, 12 in. maximum, 4 in. minimum; diameter of plunger, 1¾ in.; and plunger stroke, 6¾ in.

Cylindrical Grinders

14-In. and 16-In. Machines Developed by Cincinnati

Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio, recently announced two new plain self-contained cylindrical grinding machines. These machines, for 14-in. and 16-in. maximum work diameters, are built in standard between-center lengths ranging from 18 in. to 168 in.

The radial bearings in the wheelhead are termed by the manufacturer as "load compensating." It is said that they are equally effective for heavy roughing cuts or light finish cuts. A plain thrust bearing, supported by a cradle type mounting, is located midway between the ends of the spindle. If reciprocation of the wheel is desired, this arrangement permits the spindle to be reciprocated by means of a hydraulic device. Lubrication of the bearings is entirely automatic.

The headstock unit incorporates a new type of drive. Power is transmitted through V-belts from the motor to the driven sheave, and thence through a silent chain to the jack-shaft and face plate. The unit is independently driven from a direct current adjustable speed motor mounted on top of the casting.

Twenty-four work speeds, ranging from 40 to 160 r.p.m. for the 14-in. size and 25 to 100 r.p.m. for the 16-in. size, are obtained from a rheostat adjustment.

Driving power for the table is supplied by a separate motor which drives the coolant pump and the change gear unit from which the various table feeds are obtained.

When direct current is not available, provision is made for generating the current by means of a motor-generator set; 1½ kw. for the 14-in. machine and 2 kw. for the 16-in.

New Developments Received

Descriptions of the following new products will appear in forthcoming issues of AUTOMOTIVE INDUSTRIES, space permitting. If you desire immediate detailed information on this equipment, we suggest that you consult the manufacturer.

Doall contour sawing machine (with dual control dial). Continental Machine Specialties, Inc., Minneapolis, Minn.

Gear checking equipment. Michigan Tool Co., Detroit, Mich.

Producto-Matic milling machine. The Producto Machine Co., Bridgeport, Conn.

Lo-Swing Imp lathe, new model. Seneca Falls Machine Co., Seneca Falls, N. Y.

Hydraulic press for calibrating preload in anti-friction bearings. Chambersburg Engineering Co., Chambersburg, Pa.

Cold saw for cutting non-ferrous tubing and bars. Cochrane-Bly Co., Rochester, N. Y.

Hollow-end milling tool. National Acme Co., Cleveland, Ohio.

Metal Forming Press

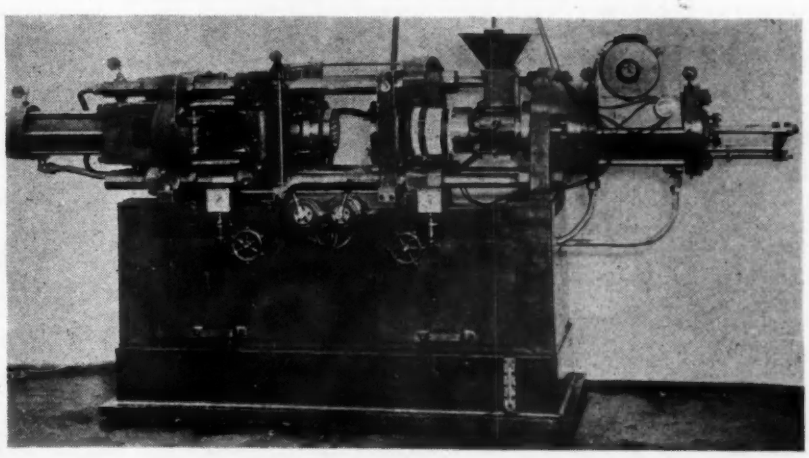
Machine for Blanking and Forming Duraluminum Aircraft Parts

A 2000-ton hydraulic metal forming press for blanking and forming duraluminum aircraft parts was recently built for the Lockheed Aircraft Corp. by the Farrel-Birmingham Co., Ansonia, Conn.

The press will exert a maximum pressure of 2000 tons with a hydraulic pressure of 2300 lb. per sq. in. applied to one 38-in. ram and two 20-in. rams. A wide range of pressures may be obtained by adjusting the pump controls, and it is possible to utilize only the 38-in. ram, giving a capacity of 1300 tons.

Dimensions of the clear space between tie rods are 61 in. wide by 97 in.

Reed-Prentice plastic injection molding machine



long. Overall dimensions of the bottom crosshead and of the moving platen are 96 in. by 133½ in. Both the moving platen and the bottom crosshead are provided with T-slots running the width of the press and having machined surfaces for addition of platen extensions.

The press has a maximum opening of 60 in. and a maximum stroke of 36 in. Closing speed is 130 in. per min.; pressing speed being from one to ten inches per min. The traverse or return speed is approximately 130 in. per min.

The hydraulic pressure pump is the radial piston type with variable pressure control and is driven by a 100 hp., 585 r.p.m. squirrel cage motor.

Milling Attachment

Unit Useful In Tool Room and In Light Production Work

The Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio, has announced a new high-speed universal milling attachment for the Cincinnati L-type, MH, and Dial Type milling machines.

The attachment spindle may be swiveled 360 deg. in a plane parallel to the face of the machine column, and 90 deg. in a plane at right angles to the face of the column. Graduations around the circumference of the housings allow accurate setting of the cutter to the desired angle.

The attachment is driven directly from the machine spindle by means of a splined shaft fitting into an adapter. This adapter is driven by the arbor-driving keys and is centered from the spindle. The overarm provides support for the attachment, and as the manufacturer states this arrangement permits the machine's cross-range to be 100 per cent usable.

Neon Test Lamps

Sundt Develops Tubes for Use in Automotive Testing

A new line of neon test lamps have been developed for use in automotive test equipment by the Sundt Engineering Co., Chicago. The tubes are made of clear glass tubing with a metallic cap on each end, and are filled with neon gas. They are sensitive to minute currents and glow with a bright red-orange color when placed in an alternating electrostatic or radio frequency field.

The principle of operation is based on a condenser action between the two metallic caps located on the outside tips of the tube, and the action and current flow follow laws similar to those applying to capacitators, with the neon gas acting as a conductor between the metallic caps.

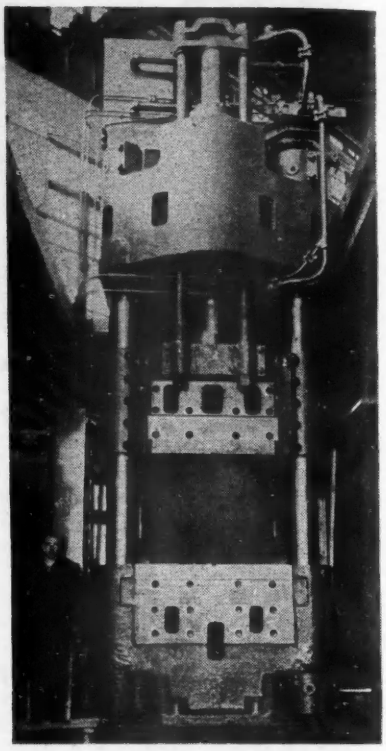
As the manufacturer states, because of their high impedance, these tubes may be operated in circuits of high voltages and low current without causing any appreciable change in the normal operation of the circuit.

Pipe Threading

Redesigned Landis Machine Handles ½-in. to 2-in. Pipe

The Landis Machine Co., Inc., Waynesboro, Pa., is now offering a 2-in. pipe threading and cutting machine of improved design.

This model is equipped with an 8-speed, built-in gear box with single pulley drive. For a motor-driven machine the motor is mounted on top of the headstock and is connected to the main drive shaft by a silent chain drive. The chuck speeds available range from 30 to 163 r.p.m. Speed of the main drive shaft is 425 r.p.m.



2000-ton metal forming press

To provide greater rigidity, the headstock now sets directly on the bed instead of on raising strips. No changes have been made in the die head, cross-rail, cutting-off attachment, and chucks.

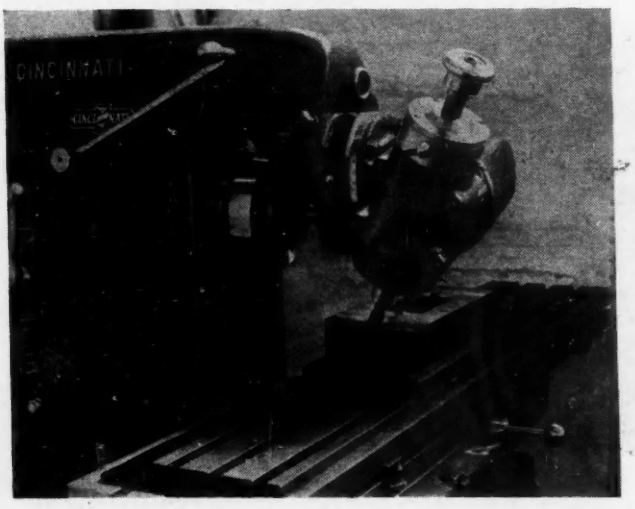
The improved machine has a capacity for threading ½-in. to 2-in. pipe. It has a carriage travel of 14 in.

Chamfering Machine

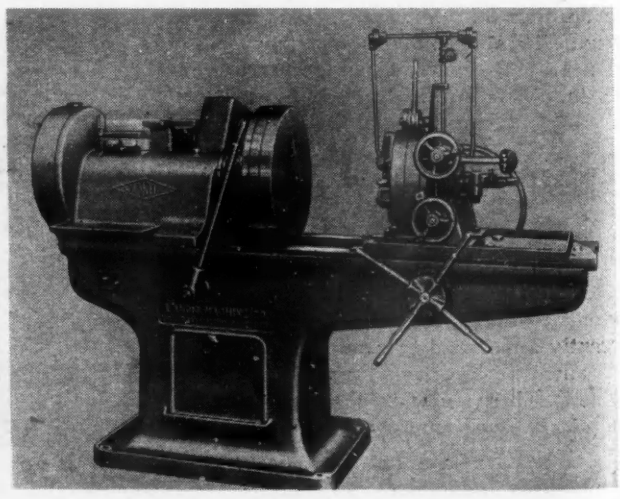
Three Models Offered by Cimatool Utilize Hollow Mill Cutters

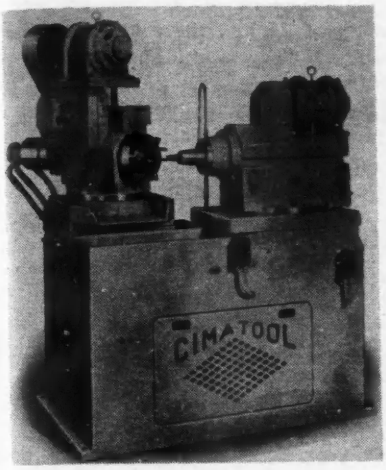
The Cimatool Co., Dayton, Ohio, has announced a high-speed gear chamfering machine available in three models with production speeds for chamfering and burring operations ranging up to

Cincinnati universal milling attachment



Landis 2-in. pipe threading and cutting machine





Cimatool gear chamfering machine

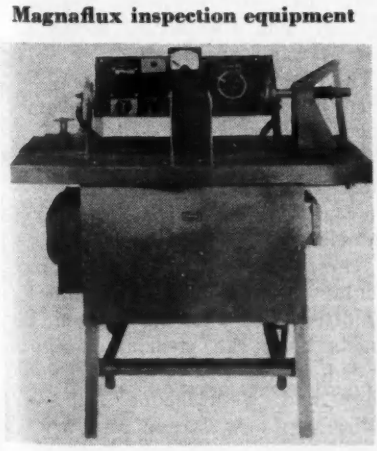
600 teeth per min. The three types are available for either air, hydraulic, or manual operation.

These machines utilize hollow mill cutters and the cutter heads are provided with rapid traverse to and from the cutting position. During the cutting period the spindles rotate while locating against an adjustable backstop.

The 4-A model is the smallest type and has a single workhead and a single cutter spindle. The 4-B model has a single workhead with two cutter spindles, both designed to simultaneously machine a single part. The 4-C is practically two complete single spindle machines on one base.

With the 4-A, the teeth on one face of the gear can be chamfered. With the 4-B, inner and outer faces of a ring or bevel gear may be chamfered simultaneously or the two cutter spindles may machine similar gear teeth on the same face of the gear from opposite sides, so that the complete chamfering of one face can be accomplished in ½ revolution of the part. The 4-C model enables one operator to load one part on one workhead while the other half of the machine is operating on another part. Two different gears may be handled by the same operator on this machine, and it is particularly adapted to performing a sequence of two different chamfering operations.

Magnaflux inspection equipment



Inspection Equipment

Longitudinal and Transverse Defects Detected by Magnaflux Device

A recent development in inspection equipment made by the Magnaflux Corp., New York City, is a device which is adapted to the detection of longitudinal and transverse defects and to the removal of any residual magnetism after parts have been inspected. The tailstock of the machine is movable and may be adjusted to take parts up to 72 in. in length.

After the part is placed in the magnetizing unit, the operator simply depresses a pedal, which action results in a mechanical clamping of the object and, at the latter part of the stroke, completing of the electrical and magnetic circuits to produce the desired type of magnetization.

The equipment operates on 60 cycles, single phase alternating current.

Forgings with a background—

Behind every Wyman-Gordon forging stands diligent scientific examination of every bar of steel—continuous laboratory control of all processes.

WYMAN-GORDON

Worcester, Mass. Harvey, Ill. Detroit, Mich.

Berlin Automobile Show

(*Continued from page* 427)

improves idling. Frame, suspension and transmission are practicall identical with the corresponding parts of the two new Wanderers, but high-pressure chassis lubrication is provided for, instead of the central system.

In the Audi 55-hp., front-drive model introduced last year the only changes made were in the body lines, while in the remaining line of the Auto Union, the Horch, the articulated rear-wheel drive, introduced on one model last year, has now been extended to the whole line with the exception of the heaviest model, which continues rigid front and rear axles. All other models have a front-wheel suspension similar to that of the new Wanderers. The Horchs are still supplied with two engine sizes, both engines being of the V-8 type. One has a displacement of 214 cu. in. and a rating of 75 hp., the other a displacement of 305 cu. in. and a rating of 100 hp.

The diversity of models offered by Auto-Union subsidiaries is quite considerable. The production in most lines is rather small, but the total turnover of the combine last year amounted to 222,000,000 marks.

The Stoewer Works of Stettin, which have been handicapped by lack of working capital in recent years, have this year introduced two new models, while continuing two of their old models, the front-drive, 152-cu. in. V-8 and the four-cylinder opposed 93-in. with rear drive and air-cooling. Both have independent springing all round. The last-mentioned model is the German edition of the Czecho-Slovakian Tatra and has gained many friends in Europe because of its stamina and excellent riding qualities. The two new models have many parts in common and are of what appears to be developing into a new standard design, embodying independent front suspension and a rigid rear axle. The frame is built up of oval-section steel tubes, but is otherwise of normal design. The front wheels are supported from the front cross member by the wishbone-type shock-absorber arm and a transverse spring below. Steering is by a Ross cam-and-lever gear. The rear wheels are mounted on banjo-type axles and are suspended by semi-elliptic springs, a Hotchkiss drive being used.

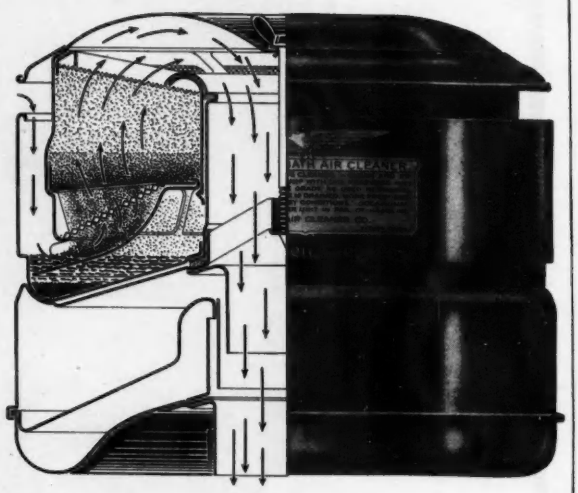
Both new models have valve-in-head engines with 3.34 by 4.17-in. cylinders, one being a four and the other a six. There are three main bearings in the four-cylinder engine, four in the six. These cars have four-speed gearboxes. Perrot mechanical four-wheel brakes are fitted (which is contrary to the general German practice), and a central chassis lubrication system is provided. Engine ratings are 54 and 82 hp. respectively, wheelbases 114 and 132 in. The rear-axle ratio is 3.88 in both cars. The smaller model has 16-5.50 tires, the larger, 17-6.50. Top speeds are given as 68 and 74 m.p.h. respectively.

The BMW concern has steadily cut down its manufacturing program and now produces solely models with six-cylinder, 122-cu. in. valve-in-head engines. Options are offered with respect to compression ratios, cylinder-head materials, and intake systems. A range of cars with the old chassis having tubular side members is continued, being fitted with a 45-hp. engine. These models have the steering heads suspended between a transverse spring above and a wishbone link below. Bodies are now larger and more at-

HIGHEST AIR CLEANING EFFICIENCY

UNITED
GUARANTEED PRODUCTS.

Cut-away view of United Oil Bath Cleaner and Silencer



DUAL OIL CONTROL

Separator divides oil reservoir into two compartments of high and low turbulence areas; enables oil circulation to occur in filter element at wider range of carburetor throttle openings.

Application of stationary fan affords mechanical control of oil — an exclusive feature found only in a United Oil Bath air cleaner, a feature fully patented.

DUAL OIL CONTROL consists of application of stationary fan in filter compartment and an oil separator in oil reservoir. The fan centrifuges oil from air stream to outer wall of filter element causing quicker oil drain back and several times faster completion of oil washing cycle than in conventional type oil bath air cleaners —thus higher cleaning efficiency. Oil separator in oil reservoir provides high and low turbulence areas, permits early oil wetting of filter element at small throttle openings without oil "pull-over" at maximum carburetor throttle openings. Dirt settling occurs more quickly in cleaner containing a low turbulence area — oil freer of dirt for air washing at all engine throttle openings. These two features, DUAL OIL CONTROL, provide highest cleaning efficiency.

UNITED AIR CLEANER CO.
9705 COTTAGE GROVE AVE., CHICAGO, ILL.

tractive than formerly, when the emphasis was on acceleration and the bodies were purposely made small.

This year the company also offers a new two-seater open sports car with the same engine but a different cylinder head. This car was developed from the models that ran in the last French Grand Prix. The engine has an aluminum cylinder head with hemispherical combustion chambers and inclined valves in the head. The compression ratio is 7.5 to 1, which is said to be just low enough to permit the use of benzol-gasoline fuel as obtainable at roadside stations. The engine can be supplied also with a still higher compression ratio, but in that case an alcohol blend must be used as fuel. As it is, it develops 80 hp. at 4500 r.p.m. Otherwise the car is identical in layout with last year's models, having front independent suspension by a transverse leaf spring. A special oil cooler is fitted and provided with a thermostatic control which allows the oil to circulate through the cooler only when it rises beyond its normal temperature. The engine also has three downdraft Solex carburetors. A top speed of 93 m.p.h. is claimed.

The Adler Works, which in recent years have specialized in front-drive cars, have brought out a new six-cylinder rear-drive model, the explanation given being that the six-cylinder engine is too long to permit of a desirable weight distribution for front drive. The new car is of thoroughly modern design, having a combined chassis and body, box-section frame members, and independent suspension at both front and rear. The front cross member has the shape of an arrowhead, and as the quarter-eliptic springs are secured to the under side of this member, they slant rearward. A hydraulic shock absorber is secured to the top of the cross member on each side, and the steering head is carried between the wish-bone-type shock absorber arm on top and the quarter-elliptic spring below. The rear wheels are mounted on cranks which are carried in rubber-insulated bearings in the rear cross member of the frame. Rear suspension is by means of a semi-elliptic transverse spring secured to the under side of a bracket back of the differential housing, which latter is also rubber-mounted. Articulated shafts transmit the power to the rear wheels.

The body is of a pronounced streamline type, with large sloping back inclosing a luggage compartment and below it accommodating the spare wheel and the (14.5-gal.) fuel tank. Access to the luggage compartment is from the inside only. The fuel filler is located in a recess in the side of the body that is provided with a locking cap. The engine compartment and the spare-wheel compartment also can be locked. Most of the points on the chassis that require lubrication are supplied from a one-shot system. Spoked, pressed-steel wheels of 16-in. rim diameter and 6-in. tires are standard equipment.

The six-cylinder engine of 2.79 in. bore and 4.13-in. stroke (146-cu. in. displacement) has a compression ratio of 6.25 and is rated 58 hp. at 3600 r.p.m. It has aluminum cylinder heads, aluminum pistons, silicon-chromium-steel valves and two cross-draft or side outlet Solex carburetors with air cleaners and silencers. The lubricating oil is forced through an edge-type filter which is cleaned automatically by the depression of the accelerator.

By placing the powerplant relatively far forward, it has been found possible to seat all occupants between wheel axes, in spite of the comparatively short wheelbase (110 in.). This is combined with a tread of 55 in.

Powerplant features include a two-plate clutch operating in oil and a three-speed, synchro-shift transmission

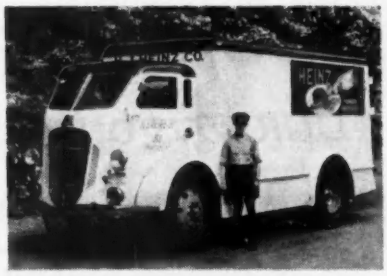
Autocar

Spicer

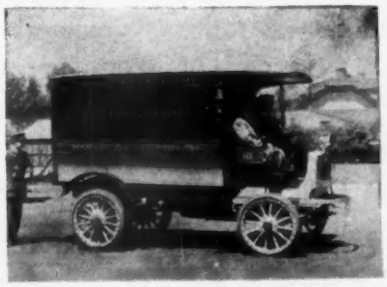
Working together for 33 years

Convincing proof of the stability, progressiveness and sound policies of two outstanding companies in the automotive field, is the long and unbroken business relationship between the Autocar Company and the Spicer Manufacturing Corporation. Both companies had their beginnings in the very early days of the industry; both companies have kept pace with its development; both companies are still thriving today.

Spicer is naturally proud of this long and successful relationship, and of its time-proved connections with many other leading manufacturers of commercial vehicles and passenger cars. Never at any time has the relationship between Spicer and manufacturer been other than the strict relationship between vendor and purchaser.



One of the modern Autocar trucks. Equipped with Spicer Needle Bearing Universal Joint.



One of the very early Autocar trucks incorporating the change to the then newly invented Universal Joint Drive. Equipped with Spicer Universal Joint.

Spicer Manufacturing Corp. • Toledo, Ohio

BROWN-LIPE CLUTCHES and TRANSMISSIONS | SALISBURY FRONT and REAR AXLES | SPICER UNIVERSAL JOINTS | PARISH FRAMES READING, PA.

controlled by means of a pullrod with pistol grip extending back from the dashboard. As the brake lever also is mounted on the dashboard, in an inverted position, the driver's compartment is entirely free of obstructions. A tunnel is provided in the floor of the body for the accommodation of the propeller shaft.

Steering is by a Ross cam-and-lever steering gear. Service brakes are of the Lockheed hydraulic type, and the brakes on the rear wheels can also be applied manually by means of the lever on the dashboard already referred to. The electrical equipment is 12 volt and the 45-a.h. battery is mounted on a shelf on the forward side of the dashboard. The four-door sliding-top sedan weighs 2866 lb. and is claimed to have a maximum speed of 78 m.p.h.

This completes the short survey of new German models. In conclusion, it is evident that American design is still influencing German makers to a considerable extent, especially as regards body lines. There is a trend toward larger engines, and valve-in-head engines are gaining ground, together with a trend toward higher compression ratios, aluminum heads, and downdraft carburetors, all intended to increase the specific output of the engines. In the past the fuel tanks on many small German cars have been located under the hood, but under the pressure of public opinion, makers are removing them to the rear. Increased use is being made of thermostats in cooling systems. Water and even oil thermometers are also being fitted more generally. One German accessories manufacturer specializes in hand-controlled radiator shutters actuated by means of a small hand crank on the steering column. This type of shutter is standard on Hanomags. Engines have been moved forward in order to gain passenger space. As already pointed out, front suspension as a rule is by means of a transverse spring and link combined with shock absorbers, but the majority of the cars have rigid banjo-type rear axles. Hotchkiss drive is very generally used. The steering geometry of independently-sprung front wheels is being simplified by the employment of a central tie rod section, to which the end sections connecting with the steering knuckles are jointed.

Three-speed gear boxes are gaining in the higher powered class, but German drivers have become so used to the four-speed units that they prefer these. It is a curious fact that the overdrive is being abandoned in favor of normal four-speed gear boxes at the very time when, owing to the opening of large sections of super highways, they should be of particular advantage. Even low-priced cars are now being provided with a central chassis lubrication system. Hydraulic brakes of the Lockheed type, as produced in Germany by the Alfred Teves Company, are practically universal.

TOO HEAVY?

DUREZ is 6 times lighter than steel!

You've probably heard about the store scale that had its weight cut from 150 lbs. to 65 lbs. largely through the use of a re-designed plastic case instead of a metal one.

While it's not an automotive application, it shows how Durez can help reduce the weight of all kinds of products — whether they're scales or automotive accessories, or one of the many mechanical or decorative parts on cars, trucks, busses.

Durez has a surprisingly high weight-strength ratio and actually weighs but one-sixth as much as steel. Proper design and proper choice of the many grades of Durez will give you moldings of great strength, lustre and lightness — which are resistant to moisture, wear, heat and electrical losses.

Look your product over carefully to see if there aren't places where the extreme light weight of Durez would be valuable. We'll be glad to work with you in developing new applications. General Plastics, Inc., 23 Walck Road, North Tonawanda, N. Y.

Choice of the Motor Industry **DUREZ** • *Plastic Materials*

Black & Decker Makes Personnel Promotions

The Black & Decker Mfg. Co. announces the appointment of John M. Schreiner as manager of the Detroit branch, succeeding the late George W. Stoiber. John Schreiner has been active in the Detroit area for the past 12 years. W. J. Fenwick, who, for the past several years has been co-manager of the Cleveland territory, has been appointed manager of all activities in that branch. G. H. Treslar has been appointed supervisor of the Detroit and Cleveland territories and will cooperate with Schreiner and Fenwick in the promotion of sales in these areas.